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16. Abstract

The FAA conducted a noise measurement survey of helicopter operations at three principal heliports in the borough of Manhattan in New York City on November 16-17, 1982. The purpose was to gather needed information for defining noise problems with in-service helicopter operations within urban areas. These noise data will be used to further define the environmental problems associated with helicopter operations in urban areas.

Statistical community noise level data, measured over an 8-hour period at each selected site, are provided which reflect the noise levels at these sites from all local sources during that particular day. Noise data from individual helicopter operations are also provided. These data from helicopter "targets of opportunity" are termed "survey data" as opposed to "controlled test data" in order to reflect the limited control over factors which contribute to the variability of the measure noise level. Noise data are presented for the Augusta A-109, Bell 47J, Bell 206L, Bell 222, Boelkow B-105, and Sikorsky S-76.

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PREFACE

This document presents the results of a noise survey conducted in community areas around three heliports in New York City. The purpose of the program was to obtain noise data to further define the potential environmental impacts associated with heliport operations in urban areas, to verify helicopter noise prediction methodologies, and to develop heliport design guidance,

The work was sponsored by the U.S. Department of Transportation (DOT), Federal Aviation Administration (FAA), Office of Environment and Energy, and performed by the DOT/Transportation Systems Center (TSC) in cooperation with the FAA Office of Environment and Energy.

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Mr. Jerry Katz	Downtown Heliport
Mr. Mike Farrell	Downtown Heliport
Mr. Fred E. Quinn	West 30th Street Heliport
Mr. Raymond G. Loughlin	Director of Services, Roosevelt Island Special Service Corporation

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1. INTRODUCTION

The FAA is in the process of performing noise field surveys of helicopter operations in urban areas within the United States. The purpose is to gather needed information for defining noise problems with in-service helicopter operations within urban areas. These noise data collected will be used to further define the environmental problems associated with helicopter operations, in urban areas.

On November 16-17, 1982, the FAA conducted a noise survey at three heliports in the New York metropolitan area. All three heliports are located in the borough of Manhattan in New York City and were selected based on different criteria. Each has a unique set of operating conditions and surroundings which afford the opportunity to assess and evaluate noise levels from helicopters for various urban characteristics.

Statistical community noise level data, measured over an 8-hour period at each selected site, are provided which reflect the noise levels at these sites from all local sources during that particular day. Noise data from individual helicopter operations are also provided. These data from helicopter "targets of opportunity" are termed "survey data" as opposed to "controlled test data," in order to reflect the limited control over factors which contribute to the variability of the measured noise levels.

1.1. SELECTION CRITERIA

In selecting heliports to perform a noise monitoring program, criteria need to be established. The criteria used are as follows:

- location of people near the heliport which could be impacted by daily operations
- sufficient number of operations (landings and takeoffs) to signify a potential noise problem
- good ground access encouraging use and growth of helicopter operations.
- potential for future growth and expansion of operations
- availability of locations to obtain reasonable community noise levels with respect to impacted areas, from helicopter operations.

Evaluation of the criteria is more or less a subjective analysis for selecting a heliport for monitoring. Location of people to the heliport is considered the most important factor and therefore has greater impact than any other factor for including that heliport in the survey.

On November 3, 1982, a survey was performed of the four primary heliports located in Manhattan. Each heliport was viewed with respect to the above criteria. The heliports surveyed were: East 60th Street Heliport, East 34th St. Heliport, Downtown Heliport, and West 30th Street Heliport.

Of these heliports three were found to be acceptable to be included in the noise survey. The East 34th Heliport was not selected for several reasons. The East 34th Street heliport is adjacent to an elevated highway (FDR Drive) with very poor ground access. There were no suitable locations to place the noise monitors. Of greater importance there were no individuals residing in the vicinity of the heliport who would be impacted by the operations at this heliport, even though it has the greatest amount of operations (30,000 per year) of all the heliports in the New York metropolitan area.

East 60th Street Heliport: This heliport is located at 60th Street and FDR Drive on the West Channel of the East River (Figure 1). Ground access to the heliport is fair with a limited amount of parking. The heliport has approximately 25,000 operations per year. The heliport is owned by the city of New York but is managed by PAN AM as a support service for shuttling passengers between Kennedy International Airport and Manhattan. Since the heliport is owned by the city, it is open to public use on a first come basis. It is the only heliport surveyed on Manhattan which can provide a hangar for long-term parking or storage of helicopters. However, the hangar facilities are limited in size and can accommodate helicopters on the size of the Hughes 500. Refueling facilities are available at the heliport.

The principle users of the heliport are executives who are ferried between Manhattan and one of the regional airports or outlying corporate offices. The other group of travelers are PAN AM passengers who are flying first or business class with PAN AM.

There have been numerous noise complaints filed with the FAA and the City of New York in regard to the operations at this facility. The complaints come from two principle locations, the residents who reside on Roosevelt Island and the residents of 500 East York Avenue. The people who live on Roosevelt Island are located to the northeast of the heliport. The people who live at 500 East York Avenue reside in a high rise building directly behind the heliport at a distance of approximately 100-200 feet.

Downtown Heliport: This heliport is located at the southern tip of Manhattan by Broad and South Street near the Staten Island Ferry Terminal (Figure 1). Ground access to the heliport is quite good, however, there are no parking facilities except for drop-off and pick-up, specifically courier service. The heliport has approximately 15,000 operations per year. The heliport is owned by the city but is operated by the Port Authority of New York and New Jersey.

The heliport is located on top of an old pier which was converted into its present use. The actual area available for helicopter usage is approximately half of what was available when the heliport opened for service. Deterioration of the piling at the end of the pier has required a reduction in available space for helicopter operations and availability of helicopter parking spaces. It is not believed that this has affected the overall operations or the number of operations at the heliport, but it

has limited the number of helicopters that can park on the pad. There are no refueling facilities available at this heliport.

The principle users of the Downtown Heliport are courier services. The heliport is in walking distance of Wall Street and the financial institutions that are located in the Battery area of Manhattan. Because of the nature of service it provides and its nearness to Wall Street, the heliport is also known as the Wall Street Heliport. It was also observed that business executives use the heliport for quick access to and from lower Manhattan.

There are no known noise complaints from helicopter operations at this facility, even though Battery Park is within walking distance of the heliport.

West 30th Street Heliport: This heliport is located on the western side of Manhattan at W. 30th Street and the Westside Highway (Figure 1). Ground access to the heliport is quite good with limited parking facilities for visitors. The heliport is owned by the State of New York and is operated by Air Pegesus. The heliport has approximately 18200 operations per year.

The heliport is located on top of a pier which has been resurfaced. It has two primary landing zones with parking space available. Refueling capabilities are available at the heliport.

The primary users of this heliport are executives and it is often referred to as the VIP Heliport. The heliport is strategically located near mid-town Manhattan so that business executives can easily enter and leave the city from mid-town. Courier service was observed to be limited.

The heliport is located in an area which is undergoing massive redevelopment. At the present time the majority of the area is warehousing and abandoned piers. Just one block north of the heliport the city is constructing a convention and exposition hall. This new complex encompasses an entire city block. There have not been any known noise complaints registered with the city or the FAA with regard to operations at this heliport.

As redevelopment continues along the Westside of Manhattan and the convention center is completed, it is anticipated this area will undergo significant changes in its land use characteristics. These changes are expected to increase the helicopter operations at this heliport.

2. EXPERIMENTAL APPROACH

2.1 BASIC APPROACH

Community Noise Analyzers (CNA) were deployed on November 16-17, 1982, in six selected community areas in the borough of Manhattan in New York City in the vicinity of the West 30th Street Heliport, the Downtown Heliport and the East 60th Street Heliport. These systems accumulated continuous noise data throughout the day, in 30 minute sampling periods, from 0800 to 1700 hours. Graphic-level time-history recordings were also produced at two sites each day. These recordings provided a hard copy record of the temporal changes of the noise levels being accumulated in the CNA systems. Instrument operators noted local intrusive sounds in a log and on the graphic history.

In addition, at one of the above sites in the vicinity of the East 60th Street Heliport and at 2 locations on the Downtown Heliport property, "target of opportunity" helicopter noise data were recorded on magnetic tape for subsequent laboratory processing. Measurement microphones were located under the flight track of approaching and departing helicopters. The data obtained on target of opportunity helicopters are termed "survey data" as opposed to "controlled test data" to reflect the limited control imposed over factors which contribute to the variability of the measured noise levels. Factors such as the absence of control or documentation on helicopter performance or positional data, and the presence of non-homogeneous ground characteristics and reflective surfaces.

2.2 MEASUREMENT LOCATIONS

Six community monitoring sites were selected in the vicinity of the West 30th Street Heliport, the Downtown Heliport and the East 60th Street Heliport. Two additional monitoring sites were selected on the property of the Downtown Heliport under the flight track of approaching and departing helicopters. The sites (shown in Figure I) are located as follows:

Site 1: This site was located 600 feet northeast of the West 30th Street Heliport near a truck depot (Figure 2). Vehicles entered and exited the depot parking lot, often within 50 feet of the microphone. The microphone, at a height of five feet, was positioned in an unused railroad bed, overgrown with weeds, adjacent to a large asphalt parking lot. The line of sight from the

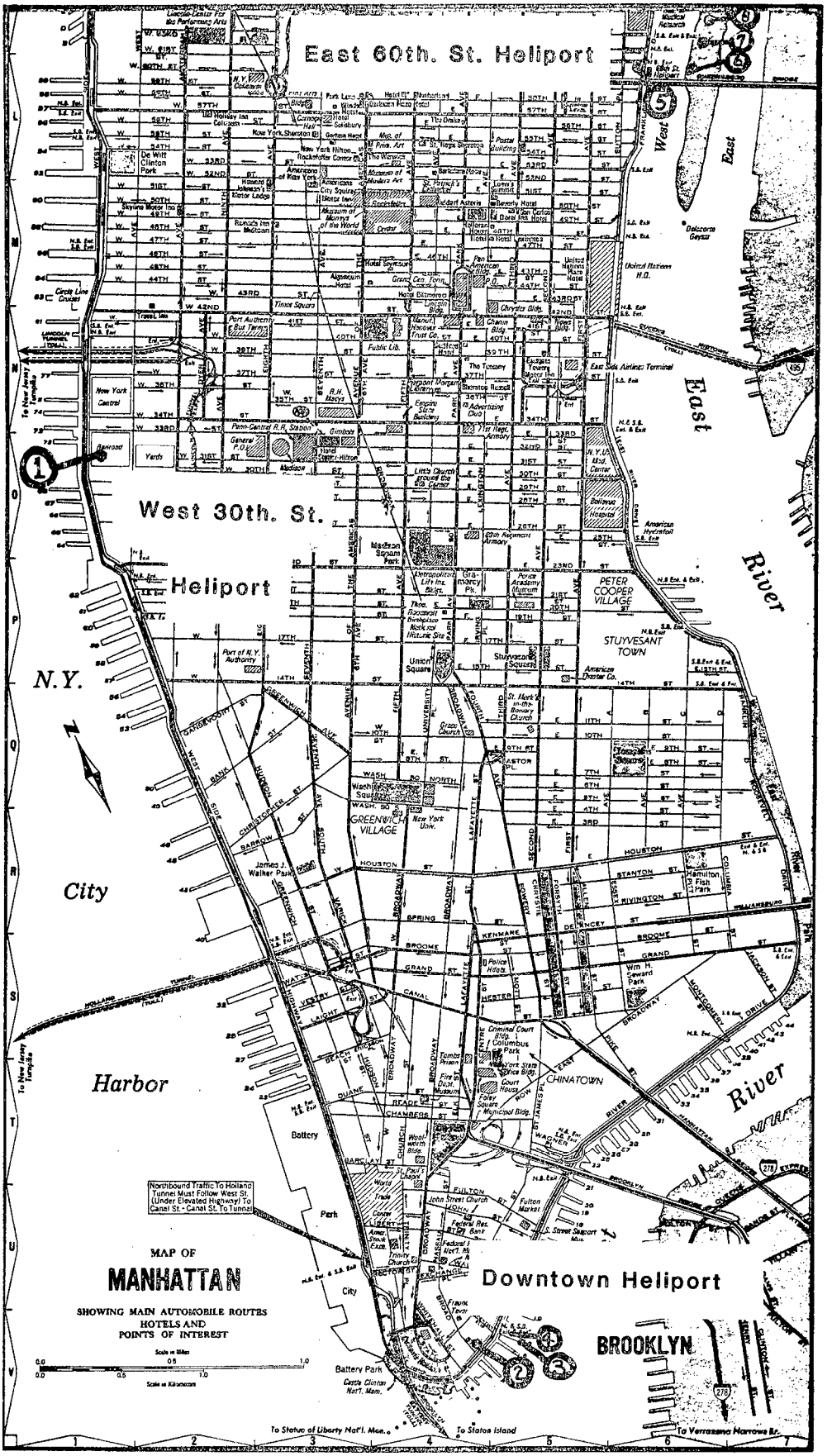

Figure 1. New York City Heliport Noise Survey Monitoring Sites November 16-17, 1982

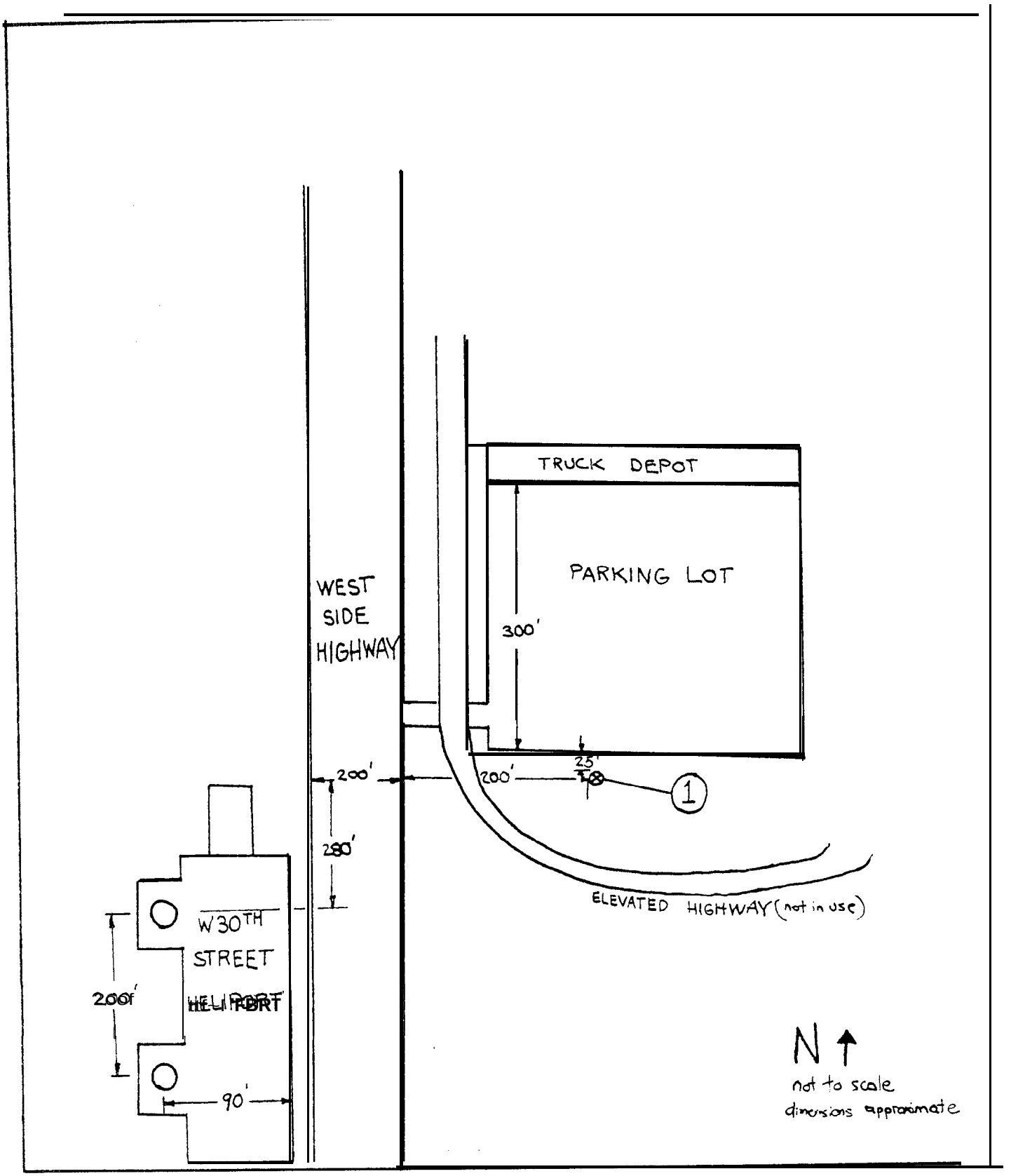

Figure 2. West 30th Street Heliport Monitoring Site
New York City Heliport Noise Survey
November 16,, 1982

microphone to the heliport was partially obscurred by an unused viaduct structure. Traffic on the West Side Highway, approximately 250 feet away, and construction activity, aproximately 400-800 feet away, were clearly audible. The construction noise included cyclic impact sounds from concrete demolition. Echos and reverberations were noted from the various structures in the area.

Site 2: This site was located on South Street approximately 700 feet northwest of the Downtown Heliport in the plaza of the American Express Building at the corner of Broad and South Streets (See Figure 3). The microphone, offset 50 feet from the center of South Street, was set at a height of 5 feet in a planter in the plaza which was 7 feet above the roadway. The microphone had a clear line of sight to the heliport. The noise at this site was dominated by constant vehicular traffic on South Street.

Sites 3 and 4: These sites were located on the pad of the Downtown Heliport under the flight track of approaching and departing helicopters (See Figure 3). The microphones for Site 3 and 4, set at a height of four feet, were offset 294 and 150 feet respectively from pad No 2. The heliport surface (an old pier) was concrete covered with asphalt.

Site 5: This site, approximately 250 feet west of the East 60th Street Heliport, was located in a playground area at the rear of an apartment complex at 500 York Avenue (See Figure 4). The microphone, at a height of 5 feet, was placed in a planter at the uppermost levels in the multilevel playground, effectively 30-40 feet above the heliport surface. The view of helicopters on the heliport surface was obscured by the west wall of the heliport. Helicopters on approach were in line of sight of the microphone until the final stages of the approach. FDR Drive, with constant vehicular traffic, was one of the dominant sources of noise at this site. It should be noted that the 26-floor apartment building and other buildings nearby produced a reverberant build-up of noises in the area.

Sites 6,7 and 8: These sites were all located on Roosevelt Island across the East River from the East 60th Street Heliport (See Figure 4).

Site 6 was located east of the heliport 25 feet from the west shore of the island, and offset 40 feet from the roadway, and 650 feet from the heliport. The microphone, on a grass surface, was set at a height of 4 feet and had a

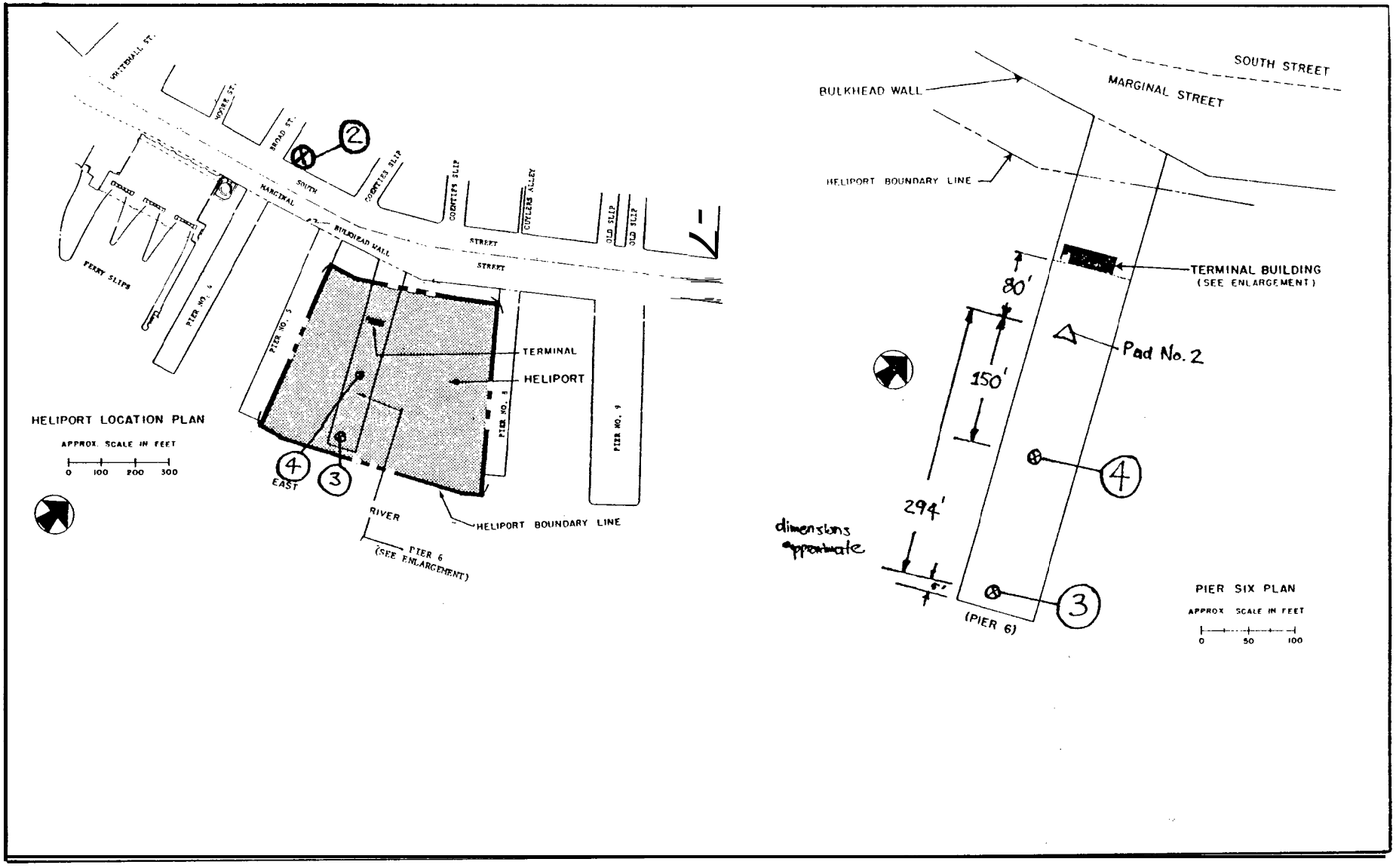

Figure 3. Downtown Heliport Monitoring Sites
New York City Heliport Noise Survey
November 16, 1982

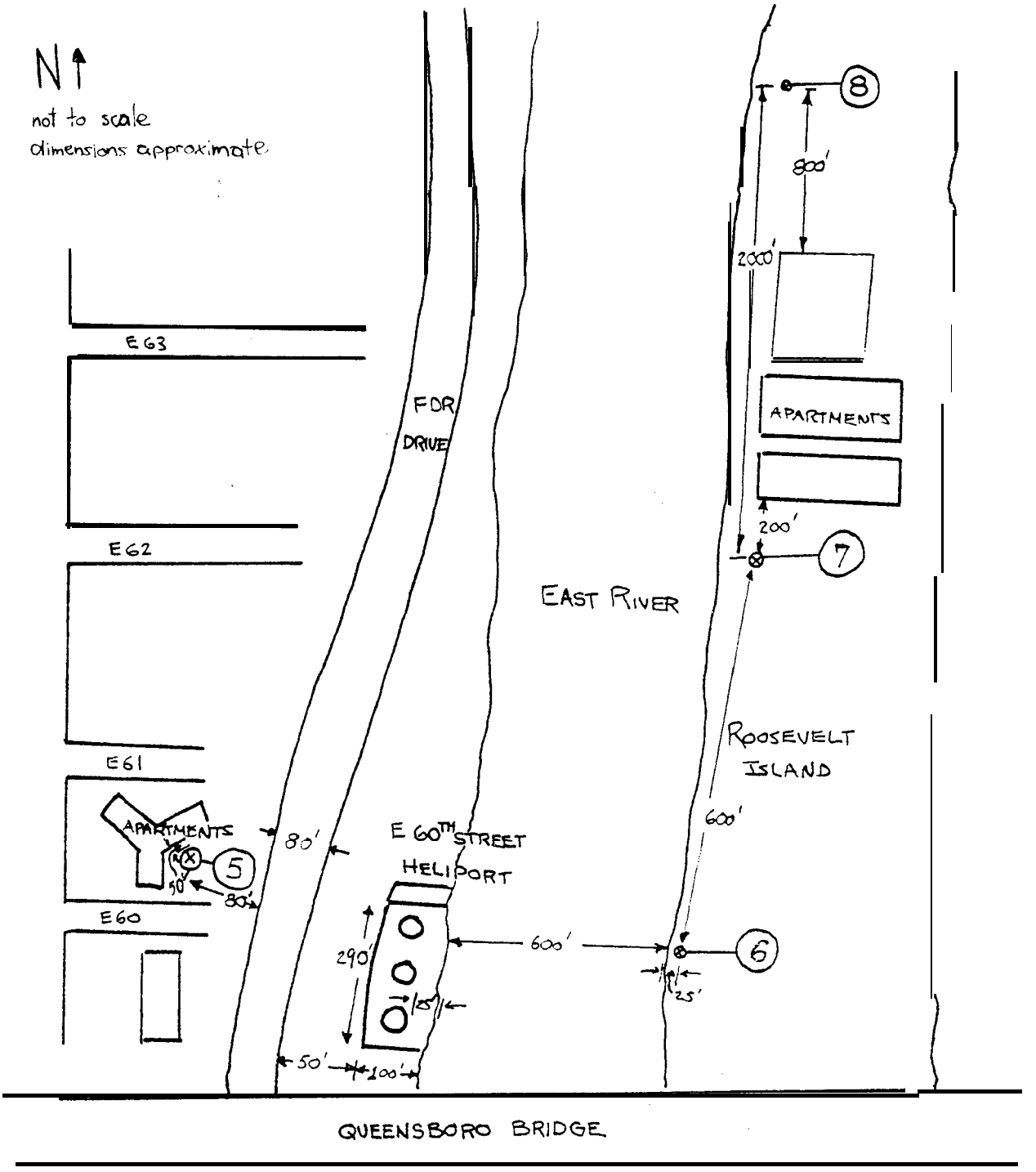

Figure 4. East 60th Street Heliport Monitoring Sites
New York City Heliport Noise Survey
November 17, 1982

clear line of sight to the helipad. Local traffic, traffic on the Queensborough Bridge, heliport operations and subway construction noise (riveting and hammering) dominated the local ambient noise.

Site 7 was located approximately 200 feet south of the apartment complex on the island, 200 feet from the west shore of the island and approximately 850 feet northeast of the East 60th Street Heliport. The microphone, set on a grass surface at a height of 5 feet, had a clear line of sight to the heliport. Noise sources included local traffic, traffic from FDR Drive across the river, heliport operations and helicopter overflights.

Site 8 was located approximately 800 feet north of the apartment complex, 230 feet from the west shore of the island and approximately 2700 feet north-northeast of the East 60th Street Heliport. The microphone was set in an unused concrete parking area. The line of sight to the heliport was obscured by the land contour. Ambient noise included noise from local traffic, traffic from FDR Drive across the river and aircraft overflights.

2.3 ACOUSTIC MEASUREMENT INSTRUMENTATION

A schematic of the acoustic measurement system is shown in Figure 5. The statistical analysis system consisted of a Gen Rad electret microphone (Model 1962-9610) equipped with a wind screen, oriented with its diaphragm parallel to the ground plane. The microphone, at a height of 5 feet was connected through a GR P-42 microphone preamplifier to a Gen Rad Community Noise Analyzer (CNA) Model 1945. The CNA first A-weighted the signal through an electronic filter network, then detected the signal with the equivalent of a "slow" sound level meter response, converted the level to digital form, and stored the digital levels in histogram registers. At the end of 30-minute periods, statistical indexes of Exceedance levels (L_x, A-weighted noise level exceeded x % of the sample time) and the equivalent continuous sound level (Leq) were extracted from the CNA on site by operators. The systems were calibrated regularly at approximately three-hour intervals.

Two locations were provided with Metrosonics model 404 Graphic Level Time History Recorders which were connected to the output of the GR 1945 Community Noise Analyzers. The graphic level recorders operated continously during the en-

tire 8-hour measurement period providing a hard-copy time history of the noise levels measured.

Figure 6 shows a schematic of a typical system used at Sites 3, 4, 6 to record data from targets-of-opportunity helicopters on magnetic tape for further laboratory analysis. The microphones at these sites were oriented for grazing incidence (diaphragm perpendicular to the ground plane) and were mounted at a height of four feet. The analog signal was amplified to a suitable recording level. The signal was recorded on one channel of the tape recorder and simultaneously applied to a pre-emphasis network prior to recording on the second recorder channel. The pre-emphasis filter attenuated those frequencies below 10 kHz at a rate of 20 dB per decade. Additional gain was applied to the filtered signal to boost the high-frequency portion of the acoustic signal, effectively increasing the high-frequency dynamic range of the measuring system.

2.4 ACOUSTIC MEASUREMENTS

Measuring systems were deployed and statistical noise data gathered during the periods from 0800 to 1700 hours at Sites 1 and 2 on November 16, 1982, and at Sites 5, 6, 7 and 8 on November 17, 1982 (see Figure 1). Noise data were accummulated in the Community Noise Analyzers for sixteen continuous, 30-minute, periods. At the end of each period, statistical data in the form of Exceedance levels (L_{x}%) and equivalent continuous sound level (Leq) were manually extracted from each unit. Operators noted local intrusive sounds during each period. At selected sites and as time permitted, 5-minute counts were taken of the local traffic during each measurement period. At Sites 1, 2, 5 and 7, graphic-level time-history recordings were produced in conjunction with the accumulated CNA data to provide a hard-copy record of the continuous noise levels measured. Intrusive events were appropriately noted on the graphic history.

At Sites 3 and 4, Helicopter operation (targets of apportunity) including approach, takeoff, flat-pitch idle-thrust (2 headings) and hover-in-ground-effect (HIGE) at approximately 5 feet (2 headings) were recorded on magnetic tape.

At Site 6, in addition to the continuous statistical data, data from normal approach and takeoff “targets of opportunity” were recorded on magnetic tape throughout the day. The tape recorder was operated only during periods of actual aircraft overflight.

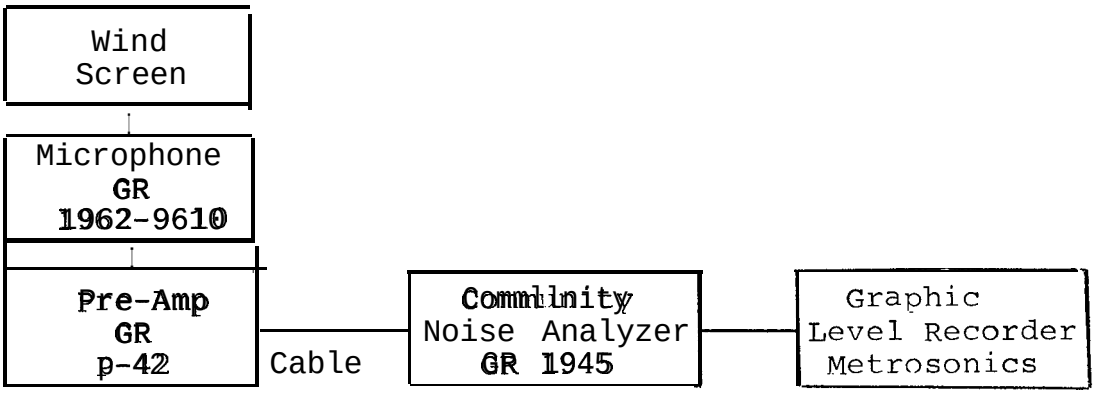

Figure 5. Measuring System Block Diagram
Site 1, 2, 5, 7, and 8
New York City Heliport Noise Survey
November 16-17, 1982

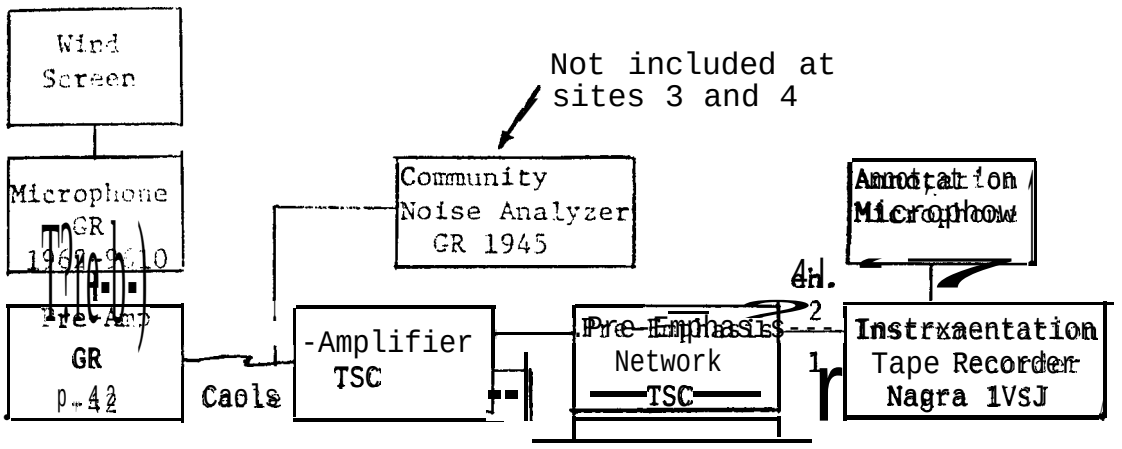

Figure 6. Measuring System Block Diagram
Sites 3, 4, and 6
New York City Heliport Noise Survey
November 16-17, 1982

microphone to the heliport was partially obscurred by an unused viaduct structure. Traffic on the West Side Highway, approximately 250 feet away, and construction activity, aproximately 400-800 feet away, were clearly audible. The construction noise included cyclic impact sounds from concrete demolition. Echos and reverberations were noted from the various structures in the area.

Site 2: This site was located on South Street approximately 700 feet northwest of the Downtown Heliport in the plaza of the American Express Building at the corner of Broad and South Streets (See Figure 3). The microphone, offset 50 feet from the center of South Street, was set at a height of 5 feet in a planter in the plaza which was 7 feet above the roadway. The microphone had a clear line of sight to the heliport. The noise at this site was dominated by constant vehicular traffic on South Street.

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Site 5: This site, approximately 250 feet west of the East 60th Street Heliport, was located in a playground area at the rear of an apartment complex at 500 York Avenue (See Figure 4). The microphone, at a height of 5 feet, was placed in a planter at the uppermost levels in the multilevel playground, effectively 30-40 feet above the heliport surface. The view of helicopters on the heliport surface was obscured by the west wall of the heliport. Helicopters on approach were in line of sight of the microphone until the final stages of the approach. FDR Drive, with constant vehicular traffic, was one of the dominant sources of noise at this site. It should be noted that the 26-floor apartment building and other buildings nearby produced a reverberant build-up of noises in the area.

Sites 6,7 and 8: These sites were all located on Roosevelt Island across the East River from the East 60th Street Heliport (See Figure 4).

Site 6 was located east of the heliport 25 feet from the west shore of the island, and offset 40 feet from the roadway, and 650 feet from the heliport. The microphone, on a grass surface, was set at a height of 4 feet and had a

2.7 DATA ANALYSIS

Statistical indexes were automatically calculated on-site by the Community Noise Analysis systems and manually extracted at the end of the 30-minute measurement periods by the instrument operators. Statistical data include the A-weighted exceedance levels (L_x %), the equivalent continuous sound level (Leq) and the maximum and minimum levels measured during the period (See Section 3.1).

Selected representative graphic level time-histories were prepared showing the time varying helicopter noise signatures at the various measurement sites (See Section 3.2).

The analog magnetic tape recordings of the measured survey noise data obtained at Sites 3 and 4 at the Downtown Heliport and at Site 6 on Roosevelt Island (East 60th Street Heliport operation) were anlyzed at the TSC laboratory in Cambridge, Ma. The recorded data were reproduced, filtered and digitized in one-half second integration periods using a Gen Rad 1921 One-Third Octave Real Time Analyzer and stored on magnetic disk. The stored data, 24 one-third octave sound pressure levels for each one-half second record, were processed using "slow" sound level meter response characteristics to obtain single event sound level data, including maximum A-weighted sound level (L_{ASM}), Sound Exposure Level (L_{AE}), spectrum levels at the time of L_{ASM} and the duration (seconds) between the 10-dB-down-points (L_{ASM-10}) of the A-weighted noise level signature. Twenty-four records were averaged together to obtain a 12-second energy average of spectral levels and the A-weighted continuous equivalent sound level (Leq) for the flat-pitch idle-thrust and hover-in-ground-effect data (See Section 3.3).

No corrections were applied to the reproduced data to account for meteorological condition or aircraft deviation from a reference flight track.

3. EXPERIMENTAL RESULTS

3.1 STATISTICAL NOISE LEVEL DATA

Tables 1-6 present statistical noise levels (Exceedance Levels $L_{x\%}$) for each 30-minute measurement period at each of the six community measuring sites. The arithmetic average and standard deviation of the statistical levels at each site are summarized in Table 7. Included in the tables are maximum and minimum levels as well as equivalent continuous sound levels (Leq).

The statistical description of the environmental noise over the selected measurement period establishes a statistical context within which the environmental impact of helicopter noise levels may be evaluated. For example, the L90 is generally used as a measure of the residual or background noise level, while the L50 to L10 levels are used sometimes to describe traffic noise. In some cases, Leq is used as a single-number description of community noise. However, there is no presently accepted single-number statistical descriptor which is used to account for the impact of helicopter noise on the community.

Although statistical noise data do not permit identification of single events, detailed observations of individual events, as logged by instrument operators, are presented in Appendix A (Physical and Weather Data) which can be used to quantify the specific impact of noise resulting from helicopter operations. With a knowledge of the physical data, and with the on-site recorded graphic level time histories a mathematical adjustment was made on the statistical data (See Section 3.2 for sample histories). For this analysis, the L_{MAX}, L5, and L20 (L20 is approximately equal to Leq + 1 dB from Table 7) levels were recalculated eliminating the noise from heliport operations from the statistical data. The analysis was performed at Sites 1, 2, 5, 6 and 7 for five of sixteen periods at each site to obtain statistically reliable data. The analysis at Site 6 was performed using single event data reproduced from magnetic tape. The analysis at Site 8 is based upon the results obtained at Site 7, the Site 8 statistical data, and the observer's on-site physical data.

The results of this analysis are summarized in Figure 7 which show average L_{MAX}, L5, and L20 noise Exceedance levels, both with and without! noise estimated from heliport operations.

Based on the statistical data presented in Tables 1-7, the adjusted statistical

Table No. 1

STATISTICAL NOISE LEVEL DATA
(30-minute periods)

Site No. - Vicinity of West 30th Street Heliport
New York, New York — November 16, 1982

START TIME	STATISTICAL NOISE LEVELS in dBA											
	LMAX	L0.1	L1	L2	L5	L10	L20	L50	L90	L99	LMIN	LEQ
0800	74	74	71	70	68	67	64	62	60	58	52	64
0830	80	80	75	73	71	70	68	64	61	59	58	67
0900	84	83	77	75	73	71	67	66	60	58	57	68
0935	74	74	72	72	71	70	65	67	63	61	55	68
1005	79	78	75	74	71	69	67	65	61	58	57	66
1035	82	81	77	75	71	69	67	65	61	58	57	67
1125	74	73	70	69	67	65	63	61	58	55	54	62
1155	77	75	69	67	64	62	60	58	56	55	55	60
1225	75	74	69	68	66	63	62	60	57	56	56	61
1300	77	71	69	68	67	64	63	61	58	54	54	62
1330	79	77	71	69	67	64	63	61	59	57	55	63
1400	78	77	75	73	70	69	68	64	61	60	59	67
1440	84	82	77	75	73	71	70	67	62	61	60	69
1510	86	83	77	75	72	71	69	64	60	59	58	68
1540	81	80	78	75	72	70	67	62	59	58	57	67
1615	81	78	74	73	71	70	69	66	62	61	60	67

Table No. 2

STATISTICAL NOISE LEVEL DATA
(30-minute periods)

Site No. 2 - Vicinity of Downtown Heliport, South Street
New York, New York — November 16, 1982

START TIME	STATISTICAL NOISE LEVELS in dBA											
	LMAX	L0.1	L1	L2	L5	L10	L20	L50	L90	L99	LMIN	LEQ
0800	80	80	79	78	76	75	74	71	69	68	67	73
0830	84	83	80	79	78	76	74	71	69	68	67	73
0900	90	85	80	78	76	74	72	71	69	68	67	72
0935	97	89	81	79	76	74	73	71	68	66	63	72
1005	92	91	79	78	76	74	72	70	68	67	66	72
1035	92	90	82	81	79	77	75	71	68	67	66	74
1125	83	82	79	79	77	75	73	70	68	67	66	72
1155	86	84	82	81	79	77	74	71	68	66	66	74
1225	85	84	79	77	76	74	72	70	67	66	65	72
1300	84	82	80	79	77	74	72	69	67	66	63	72
1330	96	93	81	79	77	75	73	71	69	68	66	73
1400	85	84	80	78	76	74	73	71	69	67	66	72
1450	81	80	77	76	74	73	72	71	69	67	67	71
1520	94	93	84	79	77	75	74	72	70	69	68	74
1550	83	82	79	79	77	75	74	73	71	69	68	74
1625	93	91	85	80	77	76	74	72	70	69	68	74

Table No. 3

STATISTICAL NOISE LEVEL DATA
(30-minute periods)

Site No. 5 - Apartment Playground West of East 60th Street Heliport
New York, New-York — November 17, 1982

START TIME	STATISTICAL NOISE LEVELS in dBA											
	LMAX	L0.1	L1	L2	L5	L10	L20	L50	L90	L99	LMIN	LEQ
0800	90	89	87	85	82	80	75	71	68	67	67	76
0830	86	84	81	80	77	75	73	72	69	68	68	73
0900	89	88	86	85	82	79	76	73	71	70	70	76
0935	86	83	80	77	75	74	73	72	71	71	70	73
1005	91	90	83	81	79	77	75	73	72	70	69	75
1035	89	87	81	80	78	76	74	73	71	70	70	74
1110	88	87	85	83	80	77	75	73	71	70	70	75
1145	85	84	82	81	78	75	74	72	71	70	69	74
1215	92	90	87	85	81	77	74	72	71	70	70	76
1245	89	88	86	83	80	78	75	73	72	71	70	76
1315	88	86	83	80	78	76	74	73	71	71	70	74
1345	91	89	86	85	83	80	76	73	71	70	70	76
1420	89	88	84	83	80	78	76	73	72	71	70	75
1450	83	82	79	78	77	75	74	72	71	70	70	73
1520	86	85	82	80	79	77	74	72	71	71	70	74
1610	91	89	86	85	83	80	74	74	72	70	70	77

Table No. 4

STATISTICAL NOISE LEVEL DATA
(30-minute periods)

Site No. 6 – Roosevelt Island, 650 Feet East
of East 60th Street Heliport
New York, New York – November 17, 1982

START TIME	STATISTICAL NOISE LEVELS in dBA											
	LMAX	L0.1	L1	L2	L5	L10	L20	L50	L90	L99	LMIN	LEQ
0800	91	90	86	85	80	78	74	69	65	64	63	75
0830	84	83	79	78	75	74	72	68	65	64	64	71
0900	88	87	84	82	79	77	75	70	66	64	63	74
0935	85	85	77	74	72	71	69	66	64	63	62	68
1005	91	90	82	80	78	76	73	68	65	64	64	73
1035	81	81	79	79	77	76	75	70	65	63	63	72
1115	88	88	83	80	77	75	73	68	64	63	62	72
1145	80	79	77	75	74	72	69	65	63	62	61	78
1215	90	89	82	80	77	73	70	64	63	62	62	71
1320	90	89	83	80	77	74	71	66	64	64	63	72
1350	90	89	85	83	80	77	74	71	66	64	63	74
1430	93	91	79	78	76	75	74	69	65	64	64	73
1500	87	86	77	77	76	74	73	70	66	64	63	72
1530	87	86	82	79	76	75	73	67	65	63	63	71
1600	90	89	85	83	80	78	75	69	65	64	63	74
1630	90	89	82	80	76	74	70	65	63	62	62	71

Table No. 5

STATISTICAL NOISE LEVEL DATA
(30-minute periods)

Site No. 7 - Roosevelt Island — South of Appartment Complex
East 60th Street Heliport
New York, New York — November 17, 1982

START TIME	STATISTICAL NOISE LEVELS in dBA											
	LMAX	L0.1	L1	L2	L5	L10	L20	L50	L90	L99	LMIN	LEQ
0800	90	85	79	77	75	74	71	66	63	62	62	69
0830	78	77	73	72	70	69	68	66	64	63	63	67
0900	81	80	76	75	73	72	71	67	64	63	63	69
0935	106	98	72	71	69	66	65	63	62	62	61	65
1005	78	76	74	73	72	70	67	65	63	62	61	67
1035	103	96	74	72	71	69	68	64	63	62	61	67
1125	80	79	75	73	71	69	67	65	62	61	61	67
1155	72	71	71	70	69	68	66	63	62	61	59	65
1225	81	80	76	75	74	72	70	65	62	61	60	67
1300	76	75	73	72	71	71	68	65	62	62	61	67
1330	81	80	76	74	72	70	68	64	62	62	61	67
1400	82	81	77	75	74	72	70	65	63	62	62	68
1450	108	101	84	77	71	70	68	65	63	62	62	69
1520	75	74	72	71	70	68	66	64	62	62	61	66
1550	80	78	76	76	74	73	72	67	64	63	62	70
1625	80	79	76	75	73	71	69	64	62	61	61	68

Table No. 6

STATISTICAL NOISE LEVEL DATA
(30-minute periods)

Site No. 8 - Roosevelt Island, 2100 Feet North - North-East
East 60th Street Heliport
New York, New York — November 17, 1982

START TIME	STATISTICAL NOISE LEVELS in dBA											
	LMAX	L0.1	L1	L2	L5	L10	L20	L50	L90	L99	LMIN	LEQ
0800	75	74	72	70	68	66	63	60	57	56	55	63
0830	73	72	70	70	65	63	61	59	57	56	56	61
0900	75	74	71	70	66	64	62	59	57	56	55	61
0935	78	77	68	64	62	60	59	56	55	54	54	57
1005	77	76	72	69	64	61	59	56	55	54	54	60
1035	72	71	68	66	63	61	59	56	55	54	53	59
1120	72	70	67	66	64	62	60	57	55	54	54	59
1150	69	68	65	63	62	60	59	57	55	54	53	58
1220	72	71	69	67	64	62	60	57	55	54	53	60
1255	73	72	70	68	66	63	60	57	55	54	54	60
1325	71	70	66	64	63	62	60	57	55	54	53	59
1355	78	77	71	70	68	65	63	59	57	56	55	62
1440	74	72	68	66	64	62	60	58	56	55	54	60
1510	76	75	70	68	65	62	60	57	55	54	54	60
1540	71	70	67	66	64	62	60	57	55	54	54	59
1615	73	72	70	69	67	64	60	56	54	54	53	60

Table No. 7

SUMMARY STATISTICAL NOISE LEVEL DATA
(Average of 16 30-minute periods)

New York, New York - November 16 - 17, 1982

Site	AVERAGE STATISTICAL NOISE LEVELS in dBA + Standard Deviation											
	LMAX	LQ1	L1	L2	L5	L10	L20	L50	L90	L99	LMIN	LEQ
1	79	78	74	72	70	68	66	63	60	58	56	65
	3.8	3.8	3.3	2.9	2.7	3.2	3.0	2.7	1.9	2.2	2.2	2.9
2	88	86	80	79	77	75	73	71	69	67	66	73
	5.5	4.6	2.0	1.3	1.2	1.2	1.0	0.9	1.1	1.1	1.5	1.0
5	88	87	84	82	80	77	75	73	71	70	70	75
	2.5	2.5	2.6	2.7	2.3	1.9	1.1	0.7	1.1	1.1	0.9	1.3
6	88	87	81	80	77	75	72	68	65	63	63	73
	3.7	3.4	3.0	2.9	2.2	2.0	2.1	2.1	1.0	0.8	0.8	2.2
7	84	82	75	74	72	70	68	65	63	62	60	67
	11.2	8.8	3.2	2.2	1.9	2.1	2.0	1.2	0.8	0.7	1.0	1.4
8	74	73	69	67	65	62	60	57	56	55	54	60
	2.6	2.7	2.1	2.4	1.9	1.7	1.3	1.3	1.0	0.9	0.9	1.3

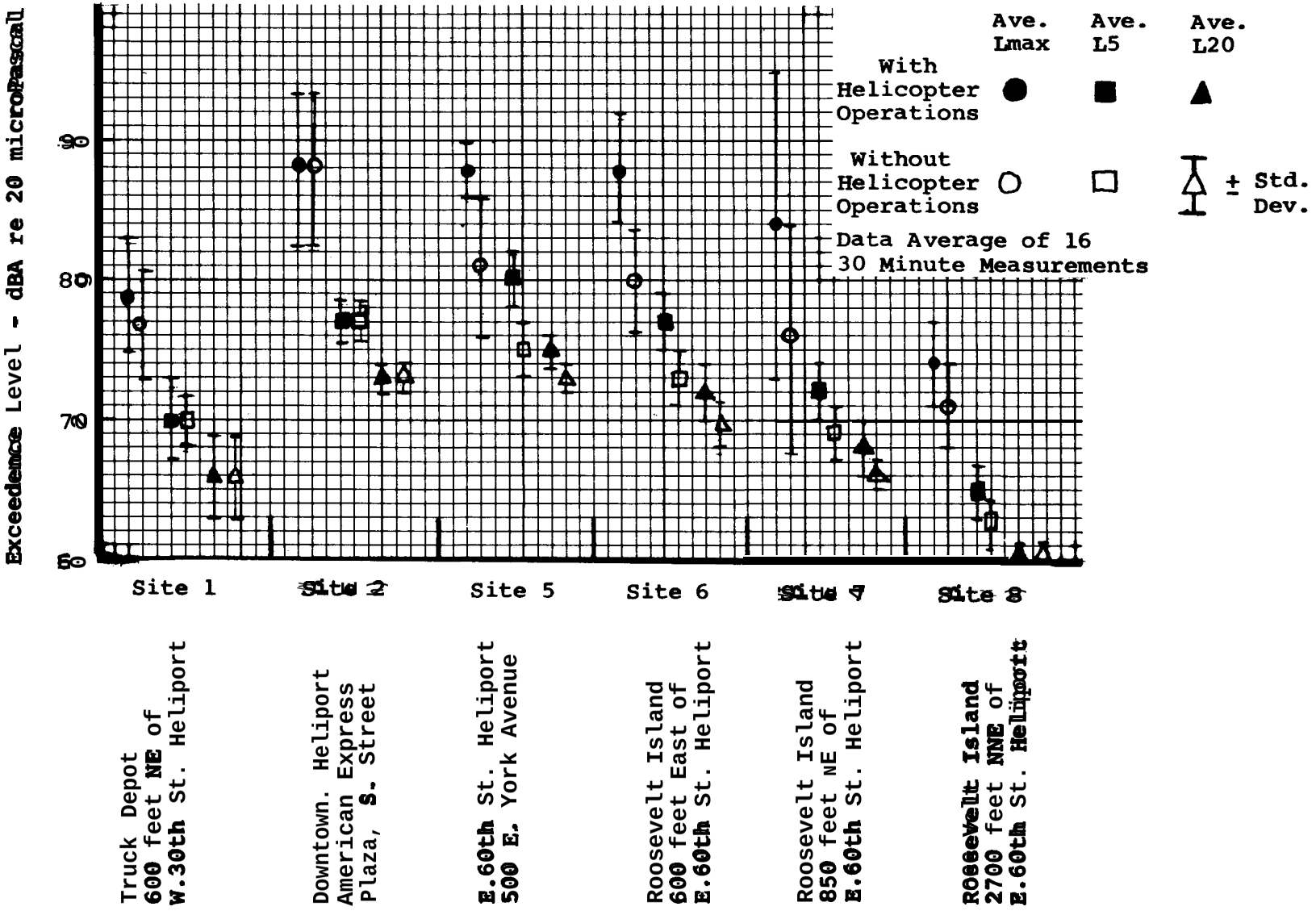

Figure 7. Adjusted Statistical Noise Level Data
Noise Survey (see Figure 1 for site locations)
New York, New York — November 16-17, 1982

noise data shown in Figure 7, and the physical data contained in Appendix A, the environmental noise at each of the measurement sites may be described as in Sections 3.1.1-3.1.6 below.

3.1.1 Site 1: Vicinity of the West 30th Street Heliport (see Figure 2)

During the 8-hour monitoring period, noise levels ranged from 52 to 86 dBA. Traffic on the West Side Highway, approximately 250 feet away, and construction activity, 400-800 feet away, dominated the ambient noise. Occurring less frequently was noise from local trucking activity in the depot parking lot where maximum noise levels ranged from 66-81 dBA. Vehicles at low speeds often passed within 50 feet of the microphone position at an average rate of 3 vehicles per 30-minute period (See Appendix A, Table A-l). The construction noise at this location included occasional impact sounds from concrete demolition activity which ranged from 69-84 dBA, amplified by echos and reverberations from various structures in the area. Helicopter overflights not associated with the heliport accounted for 3-4 events per 30-minute period ranging in maximum noise level from 63 to 79 dBA.

Also occurring at this site was noise from helicopter operations at the nearby West 30th Street Heliport which averaged 3 per 30-minute period, with the maximum noise level ranging from 67-83 dBA. Although the noise from helicopter operations associated with the heliport were audible, they occurred for only brief periods and had little effect on the statistical noise levels. This is shown in Figure 7 where it can be seen that mathematically removing the influence of the noise from heliport operations reduced the average maximum level only 2 dB, while the average L5 and L20 levels were unaffected.

3.1.2 Site 2: Vicinity of Downtown Heliport (see Figure 3)

The noise levels at this site ranged from 63 to 97 dBA during the 8-hour monitoring period. The noise was derived from congested city traffic, including constant flow vehicular traffic on South Street. Several vehicular traffic counts on South Street showed between 150-522 automobiles and 18-72 buses and trucks per 30-minute period (see Table A-2). The maximum noise from individual vehicles ranged from 74-85 dB. Helicopter overflights not associated with heliport operations (3 events per 30-minute period) ranged from 70 to 80 dB. Occasional auto and truck horn blasts, police and ambulance sirens and ship horn blasts in the nearby harbor accounted for maximum levels ranging from 84-96 dBA.

Helicopter operations at the Downtown Heliport (approximately 5 per 30-minutes) ranged from 75 to 84 dBA at this site. In comparison to the noise from the congested traffic, the noise from heliport operations, although characteristically discernable, made little impact on the area. This is shown in Figure 7 where it can be seen that mathematically removing the influence of helicopter operations had no effect on the L_{MAX}, L5 or L20 statistical levels.

3.1.3 Site 5: Vicinity of the East 60th Street Heliport (see Figure 4)

Although the line of sight from microphone to helipad surface was obstructed by the west wall of the heliport, the helicopters were clearly visible from the microphone during the last stages of approach, after departure and during some hover operations above the helipad. Noise levels ranged from 67-92 dBA during-the 8-hour monitoring period at this site. The ambient noise level was dominated by automobile traffic on FDR Drive adjacent to the East River. The distance from the microphone to the near lane of FDR Drive was approximately 80 feet (see Figure 4). The high volume stream of traffic, on this six-lane controlled-access-route with no truck traffic, was constant through the day keeping the background noise within a narrow range of 70-73 dBA.

Helicopter overflights not associated with the heliport average 4 per 30-minute period with maximum levels ranging from 72 to 84 dBA. There were few other audible noise sources in the area except for sporadic construction noise with maximum levels varying from 79-88 dBA. Children rarely played in the playground during the measured period since it was quite cold.

Although the noise level from traffic on FDR Drive was quite high at this site, helicopter operations occurring at the nearby 60th Street Heliport were clearly audible. Heliport operations averaged 6 per 30-minute period, ranging in maximum level from 85 to 91 dBA. Echos and reverberations of helicopter noise from building surface reflections, especially from landings, were clearly evident. From Figure 7 it can be seen that mathematically removing the influence of helicopter operations from the measured statistical data reduced the average maximum level by 7 dB, the average L5 by 5 dB and the L20 by 2 dB.

3.1.4 Site 6: Roosevelt Island (see Figure 4)

During the 8-hour monitoring period, noise levels ranged from 61-91 dBA. Traffic noise from local roads, from the Queensborough Bridge, and construction noise dominated the ambient noise. Traffic counts taken during five selected periods show a range of 13-42 autos and 3-22 buses and trucks per 30-minute period, as shown in Appendix A, Table A-4. The construction noise at this site consisted mostly of, riveting, which had a typical maximum noise level of 75-80 dBA, and hammering (70-75 dBA). Helicopter operations from the E. 60th Street Heliport across the river averaged 6 per 30-minute period. The maximum noise recorded at this site from the heliport operations ranges from 78 to 92 dBA. It can be seen from Figure 7 that mathematically removing the influence of helicopter operations from the measured statistical data reduced the average maximum level by 8 dBA, the average L5 by 4 dBA, and the average L20 by 2 dBA. It should be noted that in the absense of construction noise the L5 would be reduced approximately 6 db.

3.1.5 Site 7: Roosevelt Island (see Figure 4)

During the 8-hour monitoring period, noise levels ranged from 59 to 90 dBA (children shouting into the microphone not included). Noise from traffic on local roads and from the FDR Drive across the river dominated the ambient noise. Noise from buses and trucks ranged from 68-77 dBA, while noise from helicopter overflights not associated with East 60th Street Heliport operations (5 per 30-minutes) ranged from 66-77 dBA. Sporadic high-level events in close proximity to the microphone included a truck crashing into the curb (103 dBA) and shouts from playing children, 100-108 dBA, as shown in Appendix A, Table A-5.

Helicopter operations from the East 60th Street Heliport averaged 6 per 30-minute period. The maximum noise resulting from heliport operations ranged from 76-82 dBA. It can be seen from Figure 7, that mathematically removing the influence of heliport operations from the measured statistical data reduces the average maximum level by 8 dBA, the average L5 by 3 dBA and the average L20 by 2 dBA.

3.1.6 Site 8: Roosevelt Island (see Figure 4)

During the 8-hour monitoring period, noise levels ranged from 53 to 78 dBA. The ambient noise at this site was dominated by local traffic and traffic from FDR Drive across the river. Maximum noise levels from local individual truck passbys, which averaged 6 per 30-minute period, ranged from 59-71 dBA. Helicopter overflights not associated with the E 60th Street Heliport accounted for approximately 7 events per 30-minute period, ranging in maximum noise level from 59 to 76 dBA (see Appendix A, Table A-6). Other sporadic noise which occurred at this site include East River tugboat noise (58-64 dBA), sirens (58-68 dBA), and construction noise (60-61 dBA).

Helicopter operations at the E. 60th Street Heliport across the river averaged approximately 6 operations per 30-minute period, with maximum levels ranging from 67 to 77 dBA. As shown in Figure 7, mathematically removing the influence of helicopter operations would reduce the L_{MAX} by 3 dBA and the L5 by 2 dBA, while the L20 remained unchanged.

3.2 NOISE LEVEL TIME HISTORIES

Representative graphic level time history recordings are presented.

3.2.1 Community Sites 1, 2, 5 and 7

Figures 8-11 present continuous noise level histories of selected time periods as measured at Community Sites 1, 2, 5 and 7, respectively. Shown on the charts are observer notes concerning local sound sources including heliport operations and heicopter overflights.

At Site 1, the ambient noise level was dominated by traffic on the West Side Highway and construction noise. Helicopter overflights and heliport operations are clearly distinguishable above the background. (Figure 8)

At Site 2, the high background noise level is from the constant flow of vehicular traffic on South Street. Noise from heliport operations is distinguishable, but clearly dominated by high level traffic noises. (Figure 9)

At Site 5, the high-volume, constant stream of traffic from the nearby FDR Drive creates an almost constant background level between 68-70 dBA. Helicopter operations and overflights are clearly evident above this background. (Figure 10)

At Site 7, the low ambient levels shown resulted from local traffic as well as

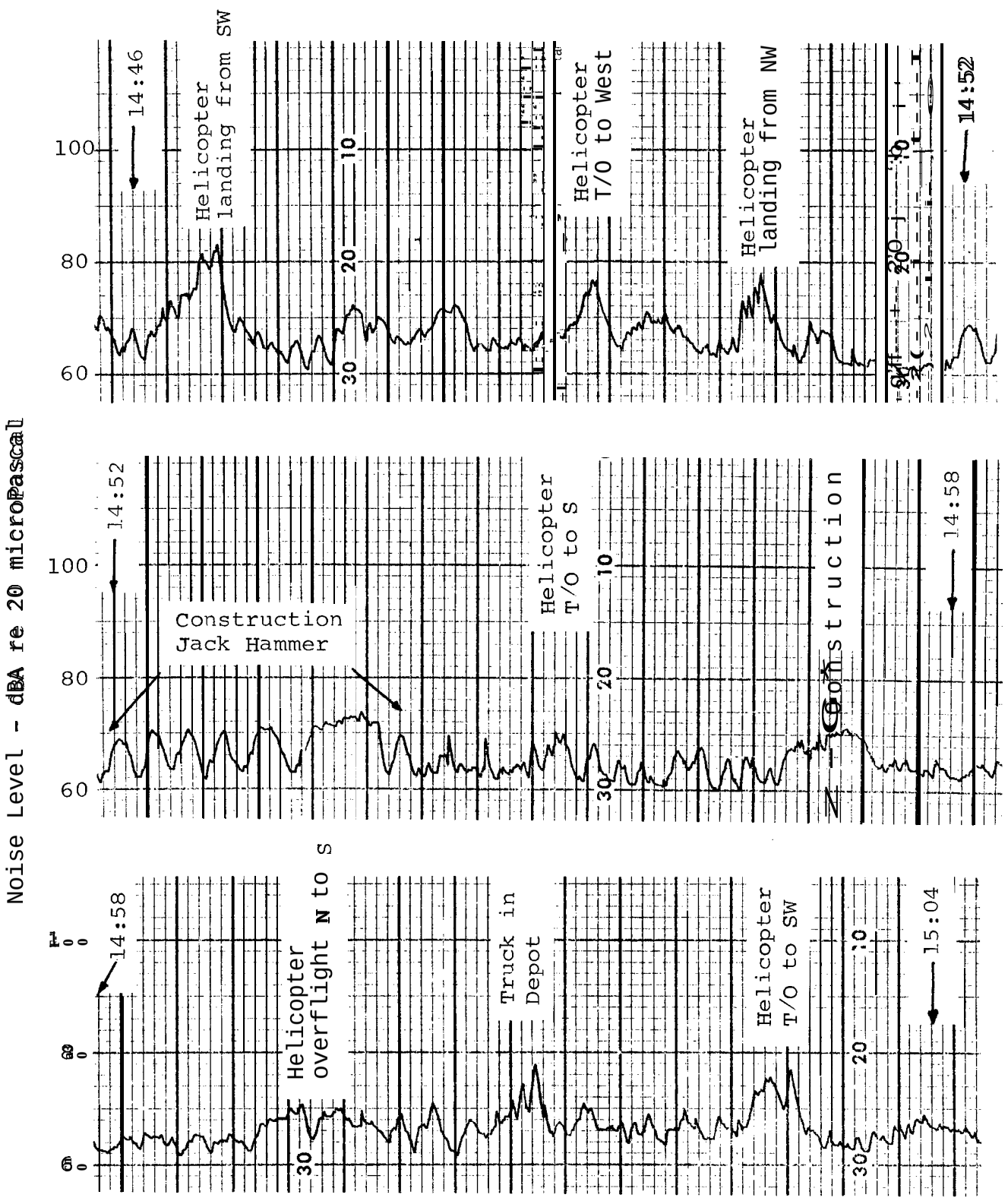

Figure 8. Noise-Level Time History Data - Site No. 1
Vicinity of West 30th Street Heliport
New York, New York — November 16, 1982

(see Figure 1. for site locations

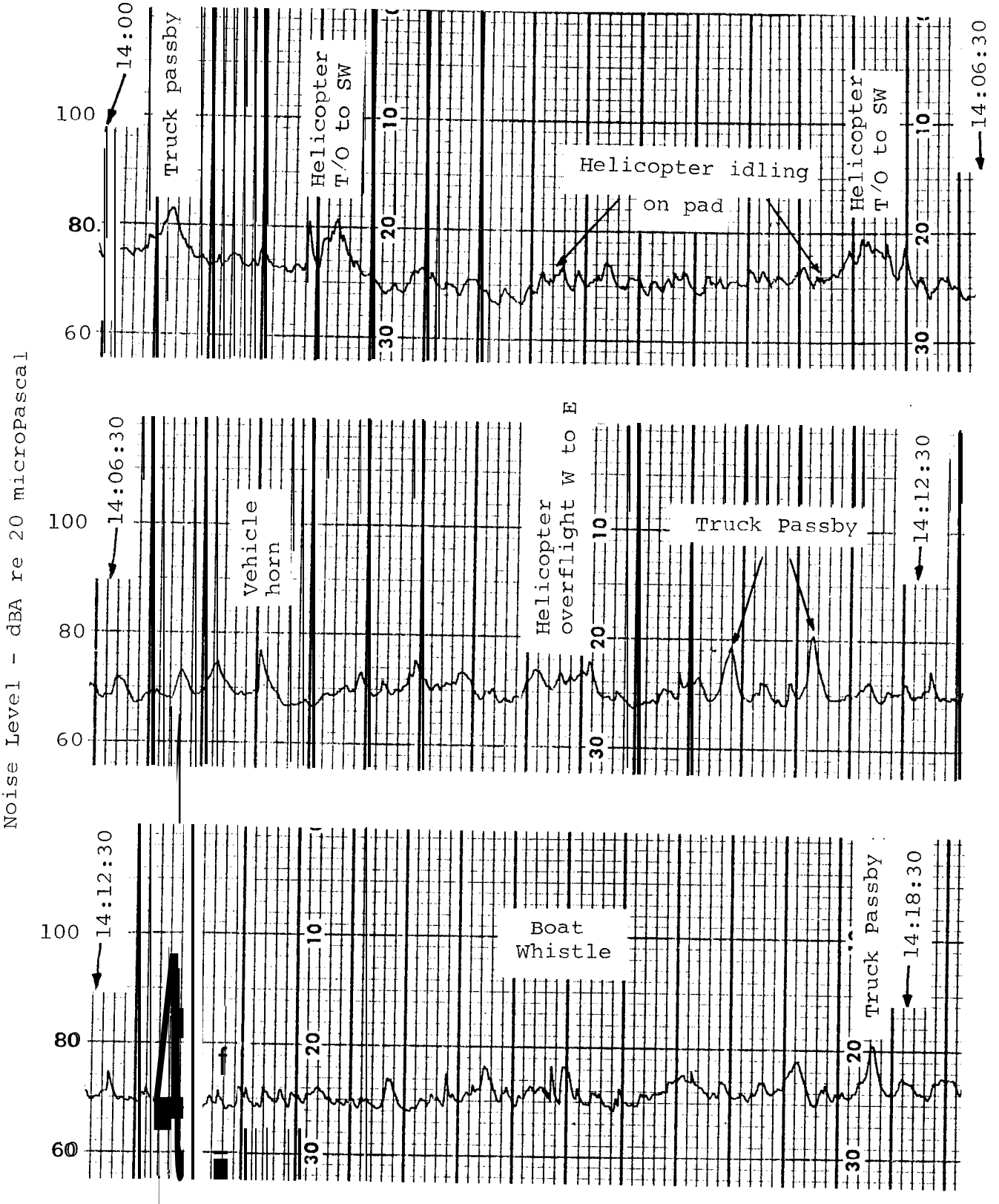

Figure 9. Noise-Level Time History Data - Site No. 2
Vicinity of Downtown Heliport
South Street, New York, N.Y. - November 16, 1982

(see Figure 1. for site locations)

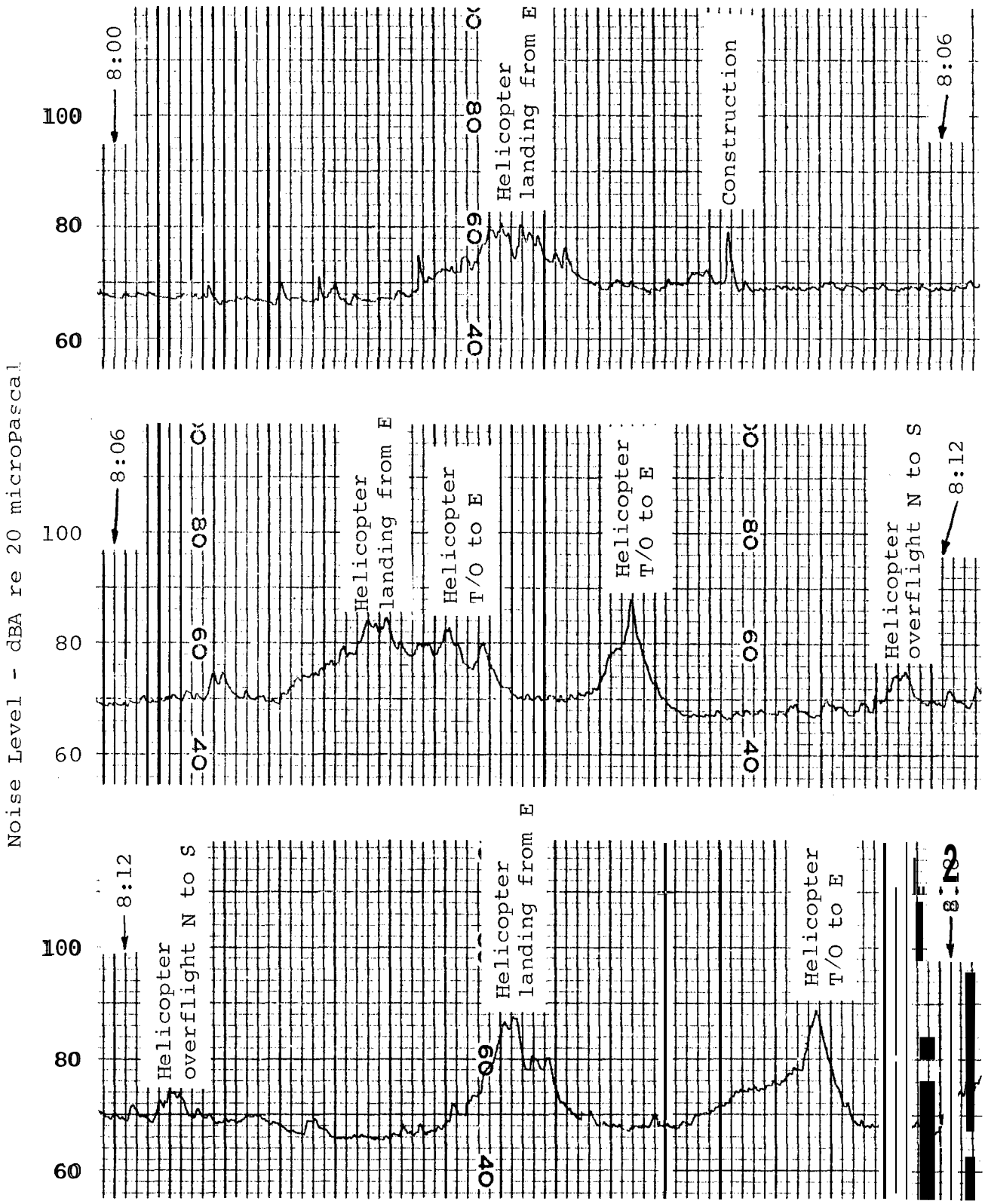

Figure 10. Noise-Level Time History Data - Site No. 5
Apartment Playground West of East 60th Street Heliport
New York, New York — November 17, 1982

(see Figure 1. for site locations)

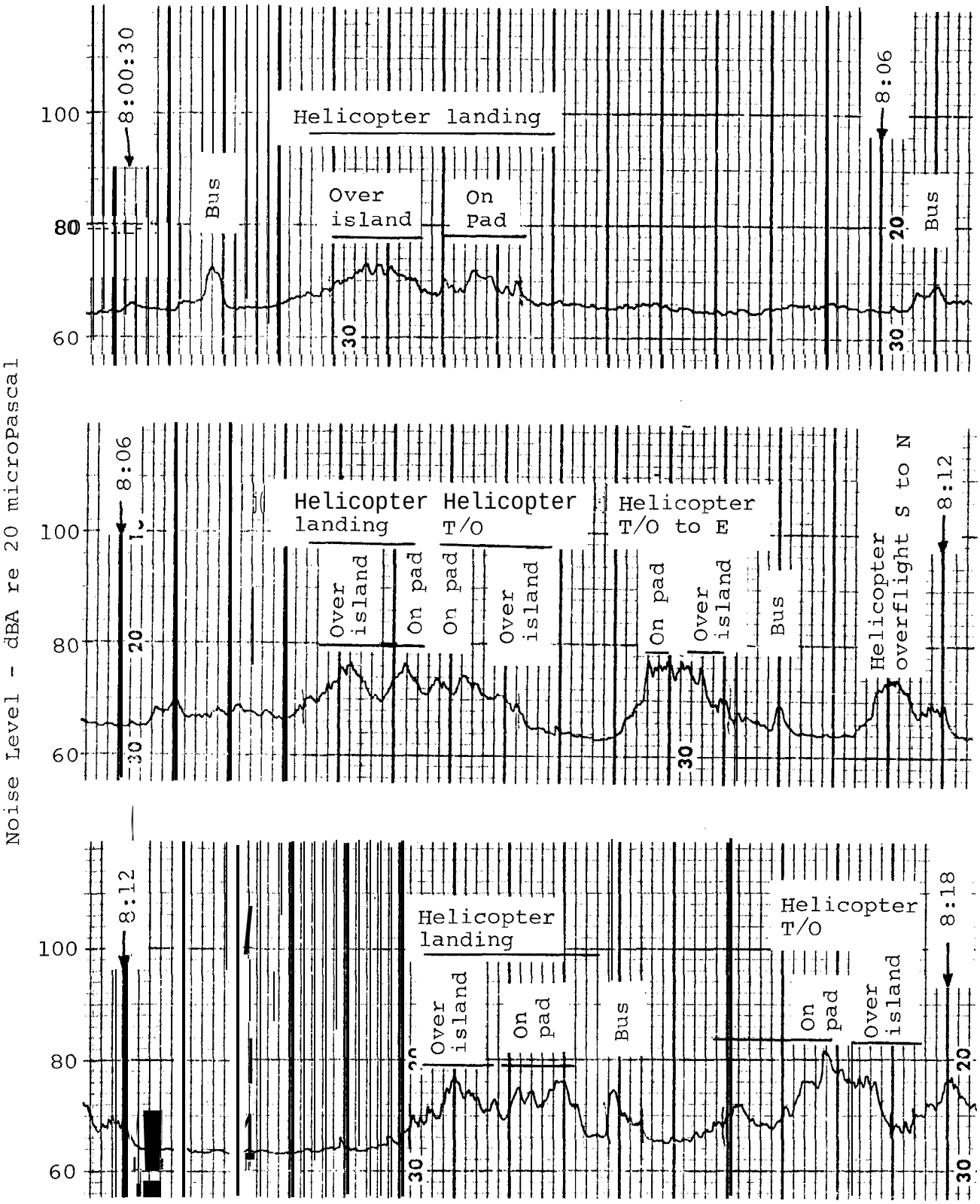

Figure 1. Noise-Level Time History Data - Site No. 7
Roosevelt Island - South of Appartment Complex
East 60th Street Heliport Operations
New York, New York - November 17, 1982

(see Figure 1. for site locations)

traffic from FDR Drive across the river. Heliport operations are evident, as well as helicopter overflights. (Figure 11)

The synchronized graphic histories of Figure 12 show the resulting noise, as measured at Roosevelt Island (Sites 6, 7) and west of the heliport (Site 5), from four heliport operations, two approaches, one landing and one on-heliport helicopter movement. The data for Site 6 were reproduced from a magnetic tape recording of individual events, while the hard copy histories for Sites 5 and 7 were produced on-site.

The approach path of the two helicopters shown landing (See Figure 12) was from the north along the east shore of Roosevelt Island, then westerly across the island over the microphone at Site 7, then across the river to the heliport. At the heliport and above the intended landing pad, the helicopters execute a 180-degree turn in the hover mode prior to setting the skids down and reducing power to idle conditions. The above path is apparent from Figure 12, where the noise from the approach at 15:53 is seen to occur first at Site 7, then from the direct overflight in close proximity to Site 6. The final approach is recorded at Site 5, whereas the noise from the 180-degree turn in the hover mode prior to setting the skids down is clearly recorded at all three sites.

On takeoff at 15:56 (Figure 12), the pre-flight preparation is also recorded at all three sites. The takeoff path is along the Queensborough Bridge to the south of the microphones of Sites 6 and 7. The impact at Sites 6 and 7 for the over island portion of the flight is seen to be less than the on-pad pre-flight preparations.

In the on-pad maneuver at 16:01 shown in Figure 12, a helicopter was moved from one end of the heliport to the other 'under its own power in the hover mode. The resulting noise signature at the three sites is evident.

3.2.2 Helipad Site No. 3

Figures 13-14 present graphic noise-level time-histories of helicopter operations of 4 selected helicopters as measured at the Downtown Heliport. Helicopters approached and departed directly over the monitoring site. Shown in the histories, in addition to the approach and takeoff noise signatures, are the data measured for two headings of the helicopters during flat-pitch idle-thrust and hover-in-ground-effect, with skids 5-feet above the pad (see Section 2.4 for helicopter operational

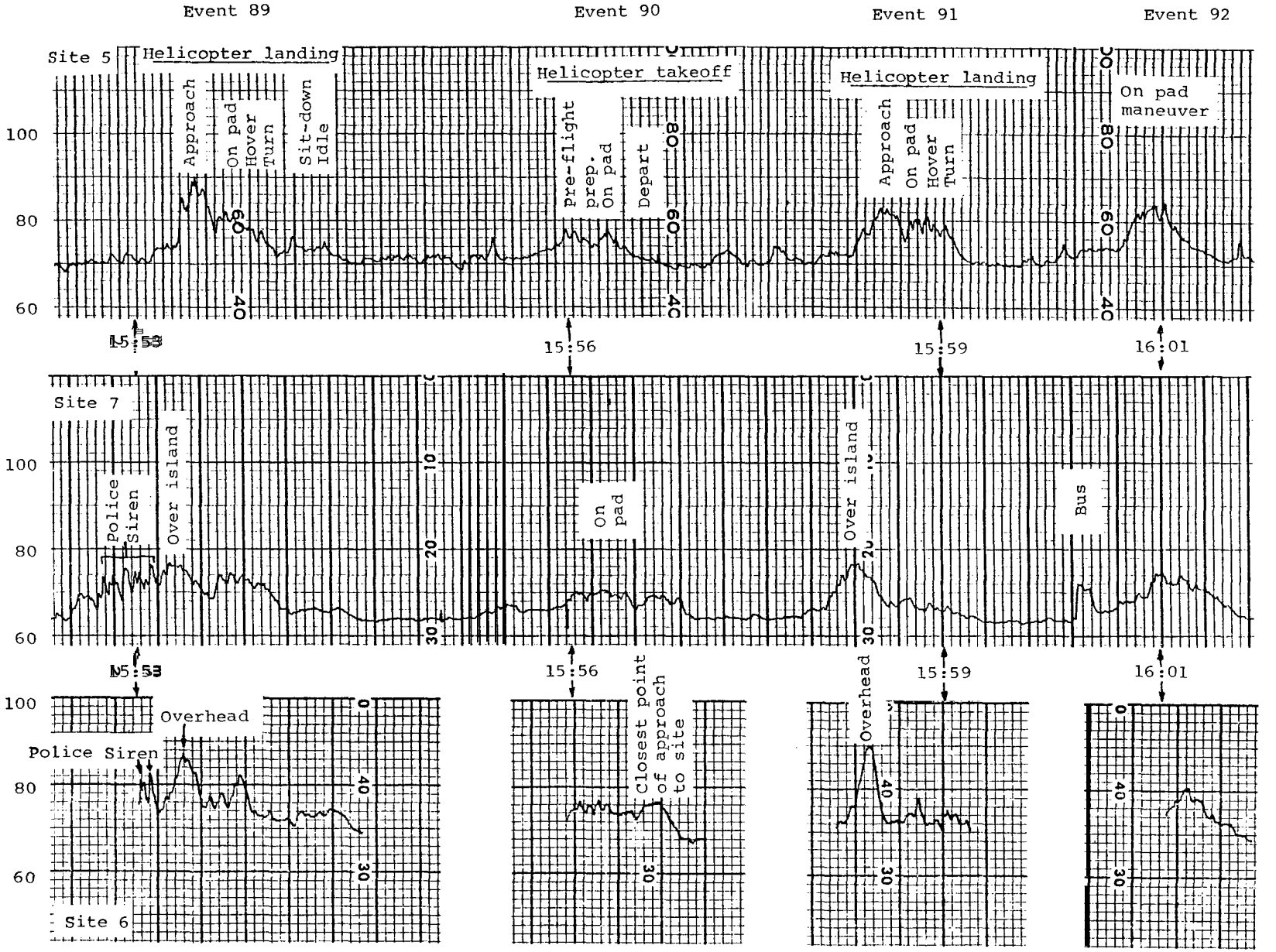

Figure 12. Synchronized Noise-Level Time Histories
Sites 5, 7 and 6 (see Figure 1.)
East 60th Street Heliport
New York, New York — November 17, 1982

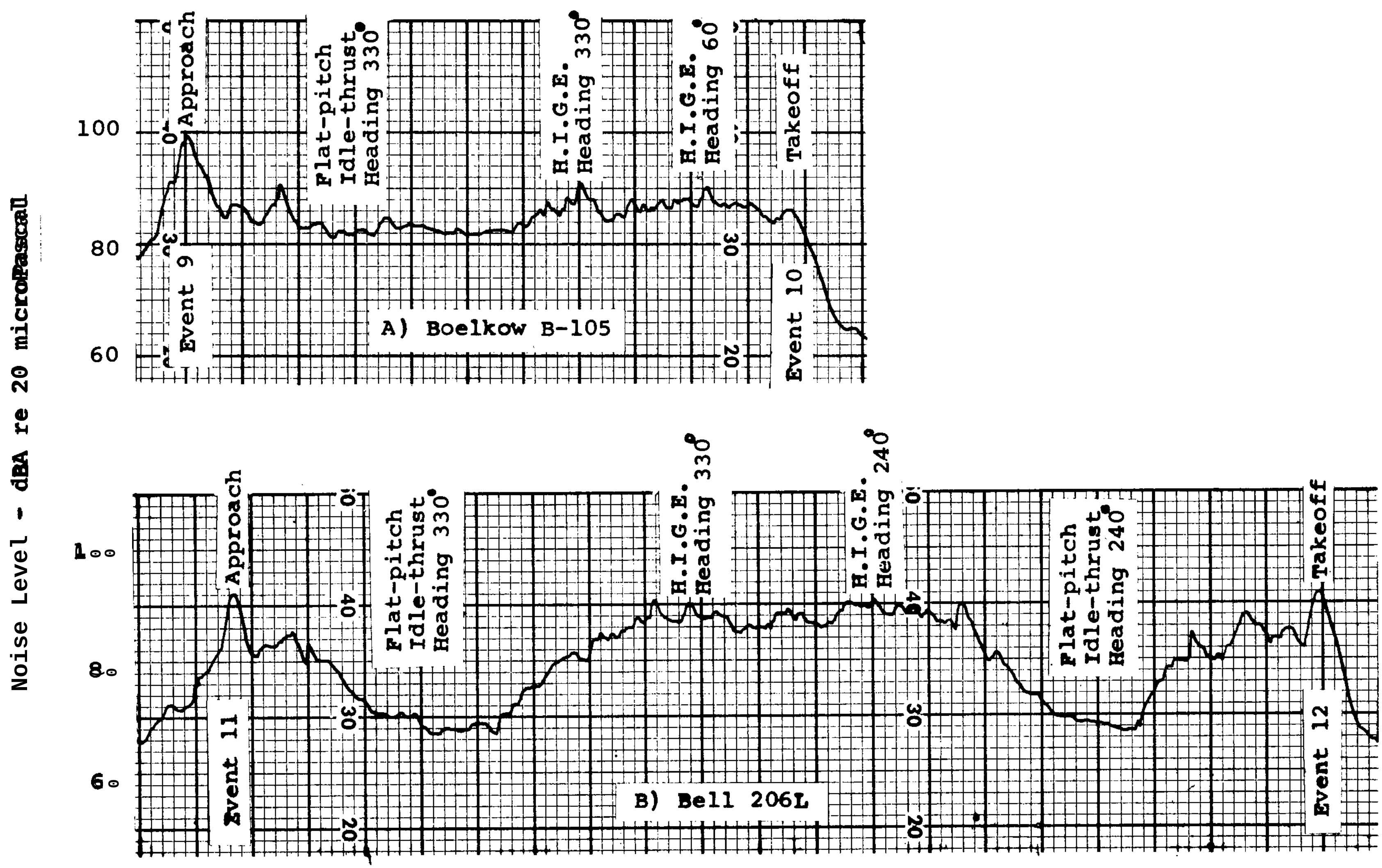

Figure 13. Noise Level History
A) Boelkow B-105 Helicopter
B) Bell 206L Helicopter
Site No. 3 Downtown Heliport
294 feet from Pad Center
New York, New York — November 16, 1982

H.I.G.E. - Hover-in-ground-effect

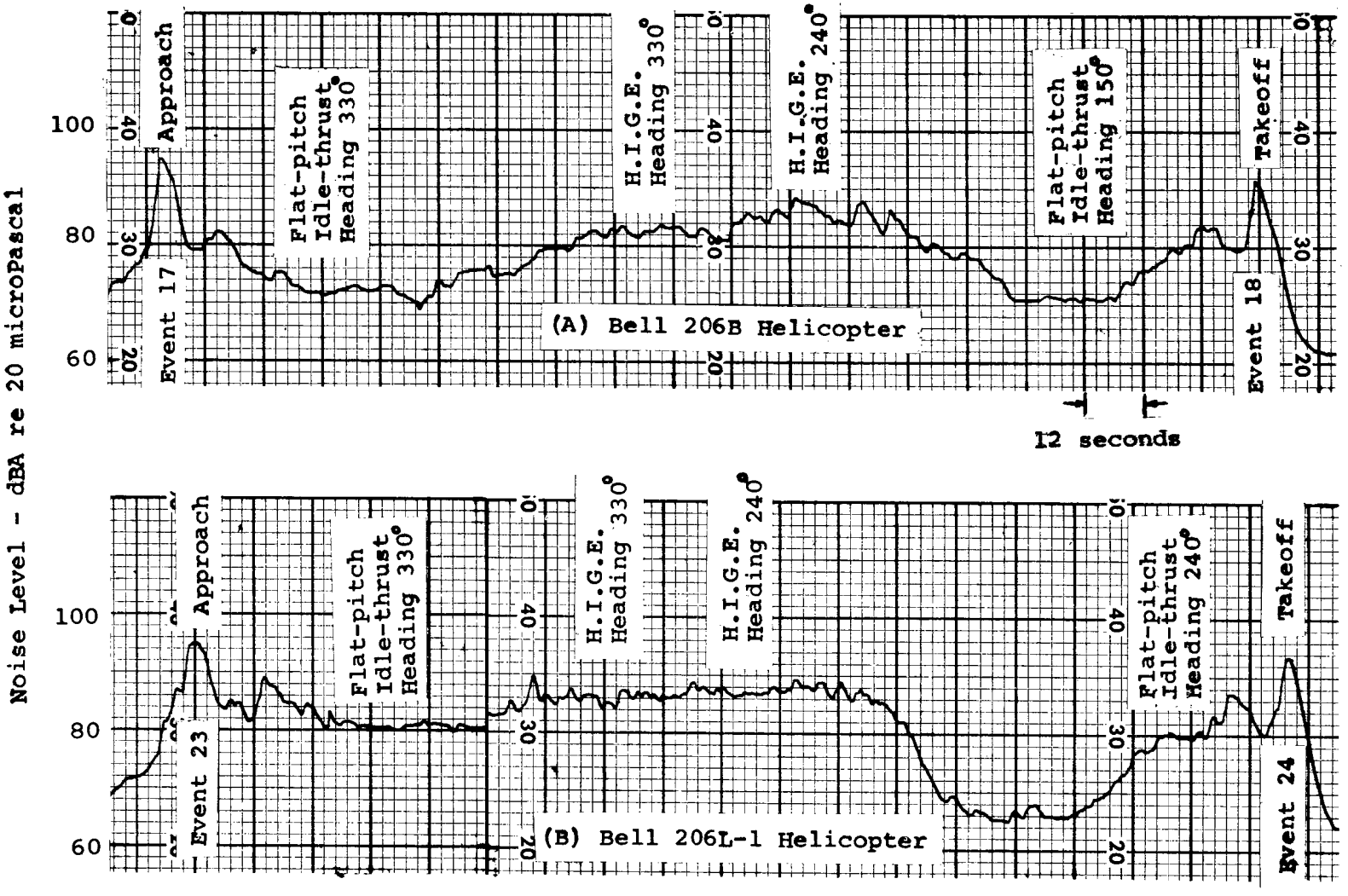

Figure 14. Noise Level History
A) Bell 206B Helicopter
B) Bell 206L-1 Helicopter
Site No. 3 Downtown Heliport
294 feet from Pad Center
New York, New York — November 16, 1982

H.I.G.E. - Hover-in-ground-effect

procedures). Summary data and 1/3 octave spectra for these and other helicopter events at Sites 3 and 4 are included in Section 3.3.

3.3 SURVEY NOISE DATA (INDIVIDUAL EVENTS)

Helicopters measured as "targets of opportunity" and analyzed as individual events are listed in Tables 8 and 24 for the Downtown Heliport and the East 60th Street Heliport, respectively. Summary survey noise data tables for these events (Tables 9 and 23) include the following indexes.

EV	Event No.	(see Table No. 8 for Helicopter type)
SEL	L_{AE}	Sound Exposure Level (dBA)
DBA(m)	L_{ASM}	Maximum A weighted Sound Level (dBA)
OASL	L_{OSM}	Maximum Overall Sound Level (dBA)
PNL(M)	L_{PNM}	Maximum Perceived Noise Level (PNdB)
PNLT(M)	L_{PNTM}	Maximum Tone Connected L_{PN} (PNdB)
DUR(A)		Duration between "10 dB-down" points of LAS Time History (seconds)

Indexes were calculated using measured data uncorrected for temperature and humidity. There were no controls or documentation on helicopter position or performance.

3.3.1 Downtown Heliport Operations

Table 9 presents summary noise level data of the approach and departure of helicopters using the Downtown Heliport during the period 12.00-14.00 hours on November 16, 1982, measured 294 feet from Helipad No. 2. All flights were approximately over the microphone array.

Tables 10-13 present 1/3-octave frequency spectra (25 Hz-10 kHz) measured at the time of L_{PNTM} for approach and takeoff events listed in Table 9. The data for four types of helicopters (Bell 206B, Boelkow B105, Bell 206L and Bell 206L-1) were measured at Site 3.

Tables 14-23 present 1/3-octave frequency spectra and A-weighted equivalent continuous levels (Leq) of noise propagated while the above helicopters were in the flat-pitch idle-thrust and hover-in-ground-effect configuration (2 headings each). The spectral data presented is the energy average of a 12-second period of data chosen during a period of stable helicopter operation. Data is provided both

at microphone 3 and 4 (294 and 150 feet respectively from the center of helipad No. 2).

An inspection of the Leq data of Tables 14-23 shows a drop-off rate of 5.6 dB per distance doubling (150 to 296 feet) for the hover-in-ground-effect data and 7.2 dB for the flat-pitch idle-thrust data. The Leq hover data are closely grouped between helicopters tested (5-7 dB), while a 20 dB spread in the Leq data is noted between helicopters measured during the flat-pitch idle-thrust configuration. This may be indicative of a large variability in the performance of the idle-thrust maneuver.

3.3.2 East 60th Street Heliport Operations

Table 25 contains summary survey noise level data of the approach and departure of helicopters at Site 6. Because of construction work in the vicinity of Site 6, only those events unaffected by the construction noise were processed (See Table 24 for helicopter type and altitude over the west shore of Roosevelt Island as provided by the individual pilots). Note that, in general, the approach track was directly over the Site 6 monitoring site; however, the departure track was approximately 400 feet south of Site 6. The elevation angle of departing helicopters to the microphone is estimated to be between 20 and 30 degrees.

Tables 26-31 contain 1/3 octave frequency spectra (25 Hz-10 kHz) at the time of L_{PNTM} for approach and takeoff events measured at Site 6 as listed in Table 25. The six helicopter types measured are Augusta A109, Bell 206B, Bell B-222, Bell 206L, Bell 47J and Sikorsky S76

4. DISCUSSION

4.1 COMMUNITY NOISE DATA

Traffic noise was seen to dominate the ambient noise levels at Sites 1 and 2 to the extent that mathematically removing the contribution of the noise from heliport operations from the cumulative noise statistics showed heliport operations having little or no impact on the noise measured at these two sites (see Figure 7).

The ambient noise level at Site 5 in close proximity to the heavily traveled FDR Drive was also dominated by traffic noise, but in a narrow range of 70 to 73 dBA. Mathematically removing the noise contributed by heliport operations to the statistical noise data measured results in a decrease in the average Exceedance levels representing the high ambient noise levels. The L5 and L20 Exceedance levels (Figure 8) are shown to decrease by 5 and 2 dB respectively and could be considered a measure of the noise impact of heliport operations at this site.

Similarly, mathematically removing noise resulting from heliport operation from the statistical data measured at Sites 6, 7 and 8 on Roosevelt Island resulted in a decrease in the average Exceedance levels representing the high ambient noise levels. The L5 and L20 levels were seen to decrease by: Site 6, 4 and 2 dB; Site 7, 3 and 2 dB; Site 8, 2 and 0 dB respectively.

4.2 SINGLE EVENT SURVEY DATA

Data on individual events recorded on magnetic tape at Sites 3, 4 and 6 were processed and are presented as "survey data", without controls on helicopter performance or position and without corrections applied for temperature, humidity or aircraft position. All of the above would be mandatory in a "controlled" test program.

As part of an overall survey being performed by the FAA at heliports in other metropolitan areas, these data will be evaluated with respect to noise levels observed at other heliports in urban areas.

TABLE NO, 8

HEL ICOPTEVR TMNOXTIS OF OFFCQRTUNITY

NOVEMBER 16 ; 2982 DOWNTOWN HELIPORT OPERATIONS

EVENT		HELICOPTER TYPE:	REG#
6	APTWROACH	BQELJQW B-- 105	N3DJ
7	TAKEOFF	BQEllKCJW B-:105	N3DJ
8	APPROACH	BELL 206B	NO1W
9	APPROACH	BQEZLKOJW E~±05	N250
10	TAKE:OFF	BOELKOJW B-- 1105	N250
11	AF'PROACH	EEL.L 206L	N2EW
12	TAKEOFF	BELJAL 206L	N2EW
13	AF'PROACH	BOELl+OJW B-:1.05	N9380A
14	TAJWKOFF	BOEL12;0W B-J OS	N9380A
15	AF'PROACH	BEKL 20bB	N76V
16	TAKEOFF	BELL 206B	N76V
k7	RPF'ROACH	BELL 206B	N50JA
18	TAKEOFF	BELL 206B	NSOJA
19	APPROACH	BE1_L %O6B	N15G
20	TAKE:OFF	BELL 2'O6B	N15G
21	AF'PROACH	BEL.L 206B	N212BW
22	TAKEOFF	BELL. 206B	N212BW
23	AF'PROACH	BELL 206L"" 1	N501.9T
24	TAKEOFF	BELL 2061-1	N5Oi9T

TABLE NO, 9

DOWNTOWN HELIPORT OPERATIONS

DWT/TSC
12/30/82

SUMMARY **SURVEY NOISE LEVEL DATA**

AS MEASURED *

SITE: 3 **(294 f t FROM FAD CENTER)** NOVe 16, 1982

EV	SEL	DBA(M)	OASPL	PNL(M)	PNLT(M)	DUR(A)
APPROACH						
6	106.5	103+2	112*1	115+9	116,5	4.5
8	94,&	87.1	94+3	99.6	100.6	13.0
9	104.7	99*2	109,7	111*4	112.1	9+5
11	96,7	92+4	100+9	105.3	105*9	6,0
13	105,6	94.6	106.2	111.6	112e5	7*5
15	100+2	93.9	106.5	107,5	108+4	10,0
17	98+&	94.5	102*5	106.6	107.4	5+5
19	103.6	95.7	98.6	106,7	108.1	15.5
21	101.2	94,2	10610	107.5	107.9	9,0
23	101e4	95.8	10&*5	108+0	108.5	8.0
TAKEOFF						
7	95.9	91.2	99.5	104.6	106.4	5.0
10	91+1	85.6	90.7	95*9	97,5	5.0
12	96.1	91.6	97.5	104.0	105+6	5.5
14	94.2	90,5	95.2	103+5	105.0	5.0
16	9&,3	93.5	98.8	107.0	109.2	6+0
18	94+7	89+9	94.8	102.2	104.0	7.0
20	93.9	84.9	90.5	96.0	97.8	24,5
22	97*2	92.7	99.1	105.4	107.1	5.5
24	97.1	93.1	98.3	105,7	107.6	5.5

* ~~SURVEY DATA~~ LEVELS **UNCORRECTED FOR TEMPERATURE AND HUMIDITY**; NO CONTROL ON **HELICOPTER** POSITION OR **PERFORMANCE**.

(SEE TABLE: 8 FOR HELICOPTER TYPE)

TABLE NO. 10

BELL 206B HELICOPTER (JET RANGER)

1/3 OCTAVE FREQUENCY SPECTRA at PNLTmax

DOT/TSC
12/22/82

AS MEASURED AT THE DOWNTOWN HELIPORT *

SITE: 3 (294 Ft FROM PAD CENTER) NOV 16, 1982

LEVEL db re20 microPASCAL (25Hz - 10KHz)

EVENT 8 APPROACH (REG# 01W)

84.0 71.4 77.3 79.8 80.1 78.1 72.9 72.5 84.1 83.3 83.3 78.6 80.7 83.5
80.6 78.1 75.7 74.6 74.4 71.5 70.5 69.3 67.3 66.4 65.1 65.2 64.5 0.0

EVENT 15 APPROACH (REG# 76U)

101.5 87.9 92.6 89.6 85.4 83.5 88.7 93.9 96.4 89.5 91.3 90.8 89.1 86.4
85.6 83.4 82.5 80.6 79.5 77.3 76.3 75.2 73.1 72.0 71.1 71.9 78.1 0.0

EVENT 16 TAKEOFF (REG# 76U)

88.0 75.7 80.9 74.5 71.2 82.6 80.0 75.2 93.2 84.5 90.5 88.7 86.7 84.0
82.7 81.9 82.1 82.1 82.4 80.5 81.3 80.7 77.5 76.4 75.3 74.5 77.9 0.0

EVENT 17 APPROACH (REG# 50JA)

95.5 84.3 87.6 86.7 79.1 78.2 82.4 88.7 94.2 90.7 92.5 93.0 90.7 90.1
87.4 8343 80.6 78.2 76.5 74.1 72.78 70.9 68.9 67.9 67.5 69.0 74.7 0.0

EVENT 18 TAKEOFF (REG# 50JA)

84.5 75.3 76.4 71.1 70.2 79.4 75.2 73.8 87.9 81.3 84.5 83.6 85.3 85.0
81.1 79.1 79.1 79.0 77.8 75.7 76.0 73.9 71.5 70.0 67.2 69.3 71.1 0.0

EVENT 19 APPROACH (REG# 15G)

85.5 74.1 83.5 79.2 74.5 84.2 82.1 76.5 87.0 82.4 86.9 82.7 85.3 89.5
91.4 88.4 86.3 84.9 84.2 81.2 79.1 75.8 73.9 75.9 69.7 70.7 70.3 0.0

EVENT 20 TAKEOFF (REG# 15G)

77.0 66.6 73.2 69.1 68.7 78.5 73.3 72.0 79.2 77.7 81.6 81.5 80.1 77.6
76.4 74.4 72.0 68.2 66.8 65.2 63.3 60.0 57.7 63.1 51.49 51.4 49.4 0.0

EVENT 21 APPROACH (REG# 212HW)

101.0 88.3 97.0 88.5 93.7 84.7 90.8 95.6 96.7 92.5 91.2 92.2 88.1 87.4
86.0 83.1 82.5 79.9 78.4 75.9 74.9 73.0 71.6 72.3 70.4 69.7 69.2 0.0

EVENT 22 TAKEOFF (REG# 212HW)

92.3 80.6 86.4 79.3 76.6 84.0 79.4 75.9 90.5 85.4 89.6 88.2 86.2 84.4
82.9 81.2 8213 82.5 82.3 80.2 79.6 78.2 74.5 72.0 69.6 68.2 66.3 0.0

* - SURVEY DATA, LEVELS UNCORRECTED FOR TEMPERATURE AND HUMIDITY.
NO CONTROL ON HELICOPTER POSITION OR PERFORMANCE.

TABLE NO, 11

BOEIKOW B-105 HELICOPTER

DOT/TSC
12/22/82

1/3 OCTAVE FREQUENCY SPECTRA at PNLTmax

AS MEASURED AT THE DOWNTOWN HELIPORT *

SITE: 3 (294 ft FROM PAD CENTER) NOV 16, 1982

LEVEL db re20 micropASCAL (25Hz - 10KHz)

EVENT 6 APPROACH (REG# 3DJ)

105.2 103.5 80.4 96.7 99.5 94.1 96.0 101.2 102.6 97.9 98.7 101.9 99.9 98.8
96.4 93.3 90.4 87.7 85.7 84.2 81.8 81.0 77.4 76.6 75.7 75.6 76.3 0.0

EVENT 7 TAKEOFF (REG# 3DJ)

89.5 90.7 69.7 74.8 80.1 87.4 73.4 84.7 94.2 86.1 87.1 86.7 83.3 83.9
82.2 83.0 82.4 79.1 76.5 76.0 74.8 74.0 72.0 71.4 71.0 70.7 70.2 0.0

EVENT 9 APPROACH (REG# 250)

105.1 102.2 82.3 91.1 92.8 90.7 88.6 91.7 95.7 91.6 92.8 95.6 93.6 94.2
92.7 91.2 89.6 87.1 85.3 83.5 80.9 79.3 77.1 76.6 75.5 75.7 76.5 0.0

EVENT 10 TAKEOFF (REG# 250)

79.7 75.7 63.4 71.1 76.2 83.4 71.9 74.0 81.1 78.6 78.9 76.5 68.9 72.5
79.5 81.5 79.4 71.1 72.4 68.5 65.7 61.4 58.5 55.1 50.8 47.6 45.7 0.0

EVENT 13 APPROACH (REG# 9380A)

95.1 99.0 77.5 90.2 94.3 87.8 88.3 93.8 96.8 95.0 92.6 94.2 95.0 93.6
92.1 90.3 89.7 86.6 85.1 83.0 81.5 79.3 76.9 76.0 75.4 76.6 78.1 0.0

EVENT 14 TAKEOFF (REG# 9380A)

84.5 87.2 62.5 66.8 71.9 77.3 66.6 79.3 88.1 80.3 82.1 84.3 82.1 81.8
79.8 80.7 81.1 79.9 78.8 79.2 77.6 77.0 75.7 73.7 72.9 73.0 72.9 0.0

* - SURVEY DATA, LEVELS UNCORRECTED FOR TEMPERATURE AND HUMIDITY,
NO CONTROL ON HELICOPTER POSITION OR PERFORMANCE.

TABLE NO, 12

BELL 206L, HEL ICOPTER (LONG RANGER)

1/3 OCTAVE FREQUENCY SPECTRA at FNLTmax*

AS MEASURED AT THE DOWNTOWN HELIPORT *

DOT/TSC
12/22/82

SITE: 3 (294 Ft FROM PAD CENTER) NOV 16, 1982

LEVEL db re20 microPASCAL (25Hz - 10KHz)

EVENT 11 APPROACH (REG# 2BW)

92.0	80,3	87,Y	86,2	79,0	82.1	89+0	92,6	93,0	88.9	9016	88.8	88.9	86!4
84.7	82.4	80.6	78.1	77,1	75.6	73.9	72.6	70.9	69,8	68.0	67,1	66.9	0.0

EVENT 12 TAKEOFF (REG# 2BW).

90.0	79.0	82+3	75.8	71.2	81+7	76,3	75.8	8918	84.7	87.6	86.7	85.4	82.7
82.1	80.8	81.8	82.2	80.2	79.0	78.1	76.8	73.4	70.9	67.7	66.2	64.6	0+0

* - SURVEY DATA , LEVELS UNCORRECTED FOR TEMPERATURE AND HUMIDITY .
NO CONTROL ON HELICOPTER POSITION OR PERFORMANCE.

TABLE NO : 13

BELL 206L-1 HELICOPTER (LONG RANGER)

1/3 OCTAVE FREQUENCY SPECTRA at FNLTmax

DOT/TSC
12/13/82

AS MEASURED AT THE DOWNTOWN HELIPORT $

SITE: 3 (294 ft FROM PAD CENTER) NOV 16, 1982

LEVEL db re20 micropASKAL (25Hz - - 10KHz)

EVENT 23 APPROACH (REG# 5019T)

10019	88.1	9214	86+9	86+8	82.9	89.9	94.1	95.4	91,5	90.1	93.1	90.4	89+3
87+8	8512	8315	82.6	80.4	77+8	76.4	75.9	73.7	71.9	70+4	&7+0	67.5	0:0

EVENT 24 TAKEOFF (REG# 5019T)

91,6	80.1	82.7	75+5	71.4	82,5	77+0	74.9	90+4	83,5	87,0	85.2	84,3	82+7
82+2	82.1	83+3	83.3	82+7	81+4	80.9	80.1	76.2	74,2	71,0	68+6	65+9	0.0

$ - SURVEY DATA, LEVELS UNCORRECTED FOR TEMPERATURE AND HUMIDITY.
NO CONTROL ON HELICOPTER POSITION OR PERFORMANCE.

TABLE NO, 14

BOELKOW B-105 HELICOPTER

1/3 OCTAVE FREQUENCY SPECTRA

DOT/TSC
12/22/82

AS MEASURED AT THE DOWNTOWN HELIPORT *

SITE: 3 (294 ft FROM FAD CENTER) NOV 16, 1982

LEVEL db re20 micro PASCAL (25Hz - 10KHz)

(12 SECOND ENERGY AVERAGE)

EVENT 6A FLAT-PITCH IDLE-THRUST (HEADING 330 DEGREES)

77.7	73.8	64.7	75.2	80.0	85.7	76.4	83.8	87.6	86.5	85.7	86.4	85.6	85.6
83.2	79.1	75.8	73.5	70.2	67.2	65.3	63.4	59.8	56.4	52.9	50.2	48.7	0.0

L(eq)= 89.1 dB(A)

EVENT 6B HOVER-IN-GROUND-EFFECT (HEADING 150 DEGREES)

77.7	74.6	63.7	71.9	76.1	83.7	76.6	79.5	83.6	82.6	82.5	83.7	84.3	84.7
83.1	79.5	76.1	75.1	73.6	71.2	68.1	65.3	60.5	56.9	52.9	49.4	45.8	0.0

L(eq)= 88.3 dB(A)

****

SITE: 4 (150 ft FROM FAD CENTER) NOV 15, 1982

EVENT 6A FLAT-PITCH IDLE-THRUST (HEADING 330 DEGREES)

86.7	82.5	70.1	83.4	85.5	89.6	82.3	88.2	92.0	90.5	90.6	91.5	90.6	91.0
89.8	86.0	82.5	81.9	80.4	78.2	76.9	75.6	73.1	70.8	69.3	68.4	69.0	0.0

L(eq)= 95.2 dB(A)

NO DATA FOR EVENT 6B AT SITE: 4

* - SURVEY DATA, LEVELS UNCORRECTED FOR TEMPERATURE AND HUMIDITY ;
NO CONTROL OR DOCUMENTATION ON HELICOPTER PERFORMANCE ;

TABLE NO. 15

BELL 206B HELICOPTER (JET RANGER)

DOT/TSC
12/22/82

1/3 OCTAVE FREQUENCY SPECTRA

AS MEASURED AT THE DOWNTOWN HELIPORT *

SITE: 3 (294 ft FROM PAD CENTER) NOV 16, 1982

LEVEL db re20 micropASCAL (25Hz - 10KHz)

(12 SECOND ENERGY AVERAGE)

EVENT 8A FLAT-PITCH IDLE-THRUST (HEADING 330 DEGREES)

76.2 72.0 71.6 71.2 71.5 81.2 74.1 73.9 78.5 75.3 79.2 78.3 74.9 74.5
73.4 69.6 66.3 63.8 60.1 56.9 55.0 52.4 49.7 48.3 45.0 41.8 39.7 0.0

L(eq)= 79.5 dB(A)

EVENT 8B HOVER-IN-GROUND-EFFECT (HEADING 330 DEGREES)

73.4 66.5 74.9 71.0 70.3 79.8 72.6 72.2 79.4 76.8 82.4 81.5 77.9 76.8
73.8 69.2 65.4 62.8 58.8 56.5 54.7 51.9 48.9 47.4 43.4 42.1 39.8 0.0

L(eq)= 81.4 dB(A)

EVENT 8C HOVER-IN-GROUND-EFFECT (HEADING 240 DEGREES)

77.0 68.3 73.4 69.7 71.5 76.0 74.0 74.6 80.1 79.1 83.6 82.6 82.8 82.5
80.4 77.7 75.0 72.9 70.9 68.4 65.6 62.4 59.4 55.9 50.9 47.5 44.3 0.0

L(eq)= 86.4 dB(A)

EVENT 8D FLAT-PITCH IDLE-THRUST (HEADING 240 DEGREES)

74.6 65.1 71.2 68.3 68.0 74.9 68.3 67.3 75.1 70.3 75.8 72.7 72.6 73.1
72.0 68.8 66.6 65.3 62.9 60.5 58.3 55.1 52.3 50.2 46.6 44.3 43.6 0.0

L(eq)= 77.7 dB(A)

****

SITE: 4 (150 ft FROM PAD CENTER) NOV 16, 1982

EVENT 8A FLAT-PITCH IDLE-THRUST (HEADING 330 DEGREES)

78.8 72.5 74.9 74.8 75.2 85.4 77.8 77.7 86.1 79.4 86.0 84.2 80.1 80.2
79.4 75.2 73.7 69.9 69.4 68.3 66.8 64.8 63.6 62.0 60.3 58.3 56.6 0.0

L(eq)= 85.7 dB(A)

EVENT 8B HOVER-IN-GROUND-EFFECT (HEADING 330 DEGREES)

81.4 69.6 78.9 77.1 76.3 85.5 77.9 77.7 86.5 81.9 88.3 86.6 82.7 81.2
78.7 73.7 72.7 73.0 71.3 68.7 66.8 65.3 62.6 62.4 60.1 60.0 58.9 0.0

L(eq)= 87.1 d(A)

NO DATA FOR EVENT 8C AND 8D AT SITE 4

* - SURVEY DATA, LEVELS UNCORRECTED FOR TEMPERATURE AND HUMIDITY.
NO CONTROL OR DOCUMENTATION ON HELICOPTER PERFORMANCE.

TABLE NO. 16

BOEING B-105 HELICOPTER

1/3 OCTAVE FREQUENCY SPECTRA

DOT/TSC
12/22/82

AS MEASURED AT THE DOWNTOWN HELIPORT *

SITE: 3 (294 ft FROM PAD CENTER) NOV 16, 1982

LEVEL db re20 micropASCAL (2ZHz - 10KHz)

(12 SECOND ENERGY AVERAGE)

EVENT 9A FLAT-PITCH IDLE-THRUST (HERDING 330 DEGREES)

76.7 68.3 63.6 68.1 78.8 80.5 68.9 78.6 79.8 80.2 77.5 78.0 77.4 76.7
73.9 73.0 69.1 65.8 61.9 60.8 59.6 58.1 55.9 52.7 49.2 46.7 44.6 0.0

L(eq)= 81.1 dB(A)

EVENT 9B HOVER-IN-GROUND-EFFECT (HEADING 330 DEGREES)

76.4 71.6 62.9 68.4 78.0 83.8 72.7 81.2 85.8 86.0 82.4 84.6 83.3 82.5
81.0 77.5 73.9 71.4 69.2 66.3 64.1 60.6 57.3 54.3 51.4 48.6 45.9 0.0

L(eq)= 86.9 dB(A)

EVENT 9C HOVER-IN-GROUND-EFFECT (HEADING 60 DEGREES)

73.0 69.9 62.5 70.4 78.8 84.7 74.4 79.9 84.8 84.0 82.7 83.1 82.9 83.3
82.5 78.9 74.8 72.4 70.3 66.4 63.6 59.7 56.2 53.1 49.3 45.6 42.1 0.0

L(eq)= 87.2 dB(A)

****

SITE: 4 (150 ft FROM PAD CENTER) NOW 16, 1982

EVENT 9A FLAT-PITCH IDLE-THRUST (HEADING 330 DEGREES)

82.0 74.0 65.3 75.8 84.8 85.8 73.5 86.0 87.0 85.7 83.7 83.1 82.3 83.3
80.8 79.5 76.2 74.9 74.5 73.6 73.0 72.6 71.2 68.8 67.0 65.6 64.0 0.0

L(eq)= 88.3 dB(A)

EVENT 9B HOVER-IN-GROUND-EFFECT (HEADING 330 DEGREES)

85.0 80.6 87.6 76.1 83.4 88.4 77.7 85.4 90.8 89.8 86.5 88.3 87.5 87.2
87.4 84.7 81.2 81.1 79.9 75.8 74.0 71.8 69.1 67.1 65.5 64.2 62.3 0.0

L(eq)= 92.8 dB(A)

EVENT 9C HOVER-IN-GROUND-EFFECT (HEADING 60 DEGREES)

83.1 80.3 68.3 77.6 84.3 90.2 80.3 86.1 91.0 89.5 90.1 90.6 90.6 91.0
89.6 85.0 82.5 82.0 81.2 78.6 77.0 74.1 71.2 68.5 66.1 63.5 60.8 0.0

L(eq)= 95.1 dB(A)

* - SURVEY DATA, LEVELS UNCORRECTED FOR TEMPERATURE AND HUMIDITY.
NO CONTROL OR DOCUMENTATION ON HELICOPTER PERFORMANCE.

TABLE NO. 17

DELL 206L HELICOPTER (LONG RANGER)

1/3 OCTAVE FREQUENCY SPECTRA

DOT/TSC
12/22/82

AS MEASURED AT THE DOWNTOWN HELIPORT *

SITE: 3 (294 Ft FROM PAD CENTER) NOV 16, 1982

LEVEL db re 20 microPASCAL (25Hz - 10KHz)

(12 SECOND ENERGY AVERAGE)

EVENT 11A FLAT-PITCH IDLE-THRUST (HEADING 330 DEGREES)

64.8 62.7 61.1 63.6 67.8 69.6 68.0 64.9 62.6 65.8 71.5 70.3 64.1 62.6
62.0 58.6 57.0 58.6 52.3 49.0 48.5 48.2 45.2 41.8 39.5 37.8 39.3 0.0

L(eq)= 70.1 dB(A)

EVENT 11B HOVER-IN-GROUND-EFFECT (HEADING 330 DEGREES)

73.4 66.8 79.3 74.4 76.2 81.5 76.9 75.6 82.5 81.3 86.2 86.3 84.3 84.2
81.6 77.4 74.4 71.4 68.6 66.6 63.9 59.9 96.0 54.3 48.4 45.0 41.5 0.0

L(eq)= 87.7 dB(A)

EVENT 11C HOVER-IN-GROUND-EFFECT (HEADING 240 DEGREES)

79.1 67.4 78.5 73.3 74.6 76.4 76.7 79.0 81.3 81.9 84.7 85.5 86.2 86.2
84.6 80.8 78.7 76.0 70.6 68.5 65.5 61.7 57.9 55.3 49.6 45.8 43.0 0.0

L(eq)= 89.6 dB(A)

EVENT 11D FLAT-PITCH IDLE-THRUST (HEADING 240 DEGREES)

64.7 61.6 62.2 62.5 62.9 72.1 64.9 67.8 63.6 64.7 65.0 63.7 63.7 62.6
61.9 59.6 57.6 56.0 52.8 51.2 50.5 50.7 47.0 43.7 41.4 46.6 40.9 0.0

L(EQ)= 68.4 dB(A)

****

SITE: 4 (150 Ft FROM PAD CENTER). NOV 16, 1982

EVENT 11A FLAT-PITCH IDLE-THRUST (HEADING 330 DEGREES)

65.2 63.7 63.2 69.4 70.9 69.2 67.8 68.7 67.7 70.1 77.5 75.3 69.0 67.2
66.5 61.3 59.3 59.5 57.? 56.0 57.9 59.4 56.6 53.9 52.4 52.0 35.2 0.0

L(eq)= 75.1 dB(A)

EVENT 11B HOVER-IN-GROUND-EFFECT (HEADING 330 DEGREES)

84.2 73.7 87.3 84.3 84.3 88.0 82.7 81.7 88.0 85.8 91.2 90.9 88.9 87.4
85.9 81.7 79.5 78.6 76.5 75.4 73.5 71.2 68.2 67.5 63.1 61.6 58.9 0.0

L(eq)= 92.4 dB(A)

EVENT 11C HOVER-IN-GROUND-EFFECT (HEADING 240 DEGREES)

85.4 73.1 82.5 82.2 82.1 84.4 83.7 85.5 88.1 88.4 91.3 91.4 90.3 88.8
87.2 83.8 83.4 83.3 80.1 78.3 75.4 72.5 69.9 68.7 64.1 61.9 60.2 0.0

L(eq)= 94.2 dB(A)

EVENT 11D FLAT-FITCH IDLE-THRUST (HEADING 240 DEGREES)

65.5 62.1 63.0 64.8 66.8 70.5 68.7 72.1 70.1 70.4 71.6 71.2 70.5 69.8
69.6 66.7 65.2 65.7 61.9 60.5 60.9 63.9 62.8 61.0 58.9 67.1 60.1 0.0

L(eq)= 77.0 dB(A)

* - SURVEY DATA, LEVELS UNCORRECTED FOR TEMPERATURE AND HUMIDITY.
NO CONTROL OR DOCUMENTATION ON HELICOPTER PERFORMANCE.

TABLE NO. 18

BOEING Be105 HELICOPTER

DOT/TSC

1/3 OCTAVE FREQUENCY SPECTRA 12/22/82

AS MEASURED AT THE DOWNTOWN HELIPORT *

SITE: 3 (294 ft FROM PAD CENTER) NOV 16, 1982

LEVEL db re20 micropascal (25Hz - 10KHz)

(12 SECOND ENERGY AVERAGE)

EVENT 13A FLAT-PITCH IDLE-THRUST (HEADING 240 DEGREES)

68.7	59.9	54.4	60.8	73.5	74.2	61.7	72.9	73.1	74.7	71.1	72.1	71.4	71.0
68.8	65.8	63.7	62.4	60.7	60.0	58.5	57.6	54.3	51.2	47.8	46.3	41.6	0.0

L(eq) = 75.7 dB(A)

EVENT 13B HOVER-IN-GROUND-EFFECT (HEADING 240 DEGREES)

62.7	60.8	56.3	65.3	72.0	79.4	72.5	77.7	81.4	81.9	82.4	83.8	84.7	86.1
84.9	81.5	77.9	76.4	76.9	75.7	73.4	69.3	65.8	62.0	58.0	54.6	51.1	0.0

L(eq) = 89.9 dB(A)

****

SITE: 4 (150 ft FROM PAD CENTER) NOV 16, 1982

EVENT 13A FLAT-PITCH IDLE-THRUST (HEADING 240 DEGREES)

84.3	74.9	62.9	75.7	84.4	84.4	72.6	87.0	86.9	86.4	83.0	82.3	80.9	82.0
78.9	76.4	72.7	71.5	72.4	73.2	71.1	71.7	69.4	68.0	65.6	64.1	62.6	0.0

L(eq) = 86.9 dB(A)

NO DATA FOR EVENT 13B AT SITE 4

* = SURVEY DATA LEVELS UNCORRECTED FOR TEMPERATURE AND HUMIDITY, NO CONTROL OR DOCUMENTATION ON HELICOPTER PERFORMANCE,

TABLE NO. 19

BELL 206B HELICOPTER (JET RANGER)

1/3 OCTAVE FREQUENCY SPECTRA

DOT/TSC
12/22/82

AS MEASURED AT THE DOWNTOWN HELIPORT *

SITE: 3 (294 ft FROM PAD CENTER) NOV 16, 1982

LEVEL db re20 micropascAL (25Hz - 10KHz)

(12 SECOND ENERGY AVERAGE)

EVENT 15A FLAT-PITCH IDLE-THRUST (HEADING 330 DEGREES)

76.0 66.1 73.0 69.2 69.6 81.2 74.1 70.6 78.4 75.6 81.4 79.7 77.3 77.9
75.8 71.8 68.7 67.2 64.1 60.2 57.7 56.2 52.8 49.6 45.8 44.3 42.1 0.0

L(eq)= 81.8 dB(A)

EVENT 15B HOVER-IN-GROUND-EFFECT (HEADING 330 DEGREES)

76.8 65.6 73.1 68.2 72.6 82.4 76.0 75.2 81.9 80.1 84.6 84.7 81.4 80.8
77.8 73.6 70.3 68.9 67.2 64.8 62.3 60.4 56.1 52.6 48.8 47.2 44.8 0.0

L(eq)= 83.0 dB(A)

EVENT 15C HOVER-IN-GROUND-EFFECT (HEADING 240 DEGREES)

76.6 65.4 72.5 69.3 72.5 80.8 79.8 78.5 83.4 80.5 85.4 84.7 84.2 83.7
81.9 79.9 77.8 75.7 73.8 70.9 67.7 64.0 60.0 55.8 52.1 50.0 47.8 0.0

L(eq)= 88.3 dB(A)

EVENT 15D FLAT-PITCH IDLE-THRUST (HEADING 150 DEGREES)

75.6 64.8 72.4 66.2 66.1 78.3 85.3 70.7 76.7 72.4 79.5 78.9 74.6 73.4
72.3 70.2 67.2 65.1 62.0 58.3 56.6 55.6 52.8 50.0 46.4 44.8 41.8 0.0

L(eq)= 79.6 dB(A)

a*********

SITE: 4 (150 ft FROM PAD CENTER) NOV 16, 1982

EVENT 15A FLAT-PITCH IDLE-THRUST (HEADING 330 DEGREES)

80.3 68.9 77.4 75.9 75.1 84.2 77.3 75.5 84.9 79.7 86.6 84.8 82.5 82.2
81.3 76.0 73.4 71.9 70.5 68.3 67.8 68.1 64.2 62.5 60.5 60.5 58.5 0.0

L(eq)= 87.0 d(A)

EVENT 15B HOVER-IN-GROUND-EFFECT (HEADING 330 DEGREES)

84.2 70.9 80.7 77.9 70.5 86.8 81.5 82.1 87.9 84.7 89.5 89.4 86.0 84.2
81.3 79.8 80.5 80.6 78.4 79.6 73.1 70.9 68.6 55.9 63.8 63.3 61.6 0.0

L(eq)= 91.0 dB(A)

EVENT 15C HOVER-IN-GROUND-EFFECT (HEADING 240 DEGREES)

81.9 70.5 79.9 79.4 81.4 89.4 85.1 84.6 89.7 86.0 92.1 90.6 88.2 86.7
82.9 84.6 84.2 83.3 81.6 79.0 76.3 74.1 71.1 67.3 65.5 64.5 63.1 0.0

L(eq)= 93.8 dB(A)

EVENT 15D FLAT-PITCH IDLE-THRUST (HEADING 150 DEGREES)

79.9 67.9 78.5 73.0 71.6 83.5 84.7 73.3 84.4 78.2 86.2 83.9 78.5 78.2
77.4 73.3 70.6 [illegible] 70.2 69.1 [illegible] 55.7 54.2 52.5 50.6 [illegible] 47.0 0.0

L(eq)= 85.1 dB(A)

* - SURVEY DATA, LEVELS UNCORRECTED FOR TEMPERATURE AND HUMIDITY..
NO CONTROL OR DOCUMENTATION ON HELICOPTER PERFORMANCE.

TABLE NO. 20

BELL 206B HELICOPTER (JET RANGER)

DOT/TSC
12/22/82

1/3 OCTAVE FREQUENCY SPECTRA

AS MEASURED AT THE DOWNTOWN HELIPORT *

SITE: 3 (294 ft FROM PAD CENTER) NOV 16, 1982

LEVEL db re20 microPASCAL (25Hz - 10KHz)

(12 SECOND ENERGY AVERAGE)

EVENT 17A FLAT-PITCH IDLE-THRUST (HEADING 330 DEGREES)

65.5 62.5 62.0 65.4 64.8 71.6 63.9 62.8 65.6 66.9 72.2 72.2 66.3 65.5
63.8 60.3 58.4 57.5 54.0 50.6 49.6 50.5 46.7 44.5 43.6 41.9 43.2 0.0

L(eq)= 71.6 dB(A)

EVENT 17B HOVER-IN-GROUND-EFFECT (HEADING 330 DEGREES)

75.8 64.6 72.3 69.1 67.9 81.9 73.8 71.4 79.1 76.8 82.5 81.9 78.4 75.9
73.8 73.0 69.6 66.5 62.3 59.0 56.5 55.1 51.7 51.6 46.4 44.8 43.0 0.0

L(eq)= 82.1 dB(A)

EVENT 17C HOVER-IN-GROUND-EFFECT (HEADING 240 DEGREES)

76.4 64.7 73.9 67.0 67.3 75.9 73.0 72.9 78.3 76.3 83.6 81.4 81.5 80.8
79.1 78.1 76.5 74.2 71.3 67.4 44.4 61.6 58.2 56.9 53.4 51.3 48.2 0.0

L(eq)= 85.9 dB(A)

EVENT 17D FLAT-PITCH IDLE-THRUST (HEADING 150 DEGREES)

64.3 62.0 61.2 63.2 63.0 69.5 63.5 64.6 64.4 64.3 66.0 65.5 63.6 63.6
62.9 60.7 59.1 58.8 56.3 55.1 54.5 54.5 51.3 48.8 47.3 45.9 41.6 0.0

L(eq)= 69.8 dB(A)

****

SITE: 4 (150 ft FROM PAD CENTER) NOV 16, 1982

EVENT 17A FLAT-PITCH IDLE-THRUST (HEADING 330 DEGREES)

66.8 66.6 65.2 65.9 74.9 75.5 68.2 73.5 74.3 76.0 82.2 82.0 76.4 75.1
74.3 70.9 65.1 64.0 62.1 41.6 61.6 62.1 63.3 59.2 58.5 56.9 54.7 0.0

L(eq)= 81.5 dB(A)

EVENT 17B HOVER-IN-GROUND-EFFECT (HEADING 330 DEGREES)

81.4 69.0 78.6 74.5 74.5 86.1 77.4 77.6 85.7 81.8 87.8 86.5 84.3 80.8
79.0 76.6 74.4 73.7 71.6 68.9 47.2 65.3 63.2 63.7 60.1 59.8 58.9 0.0

L(eq)= 87.3 dB(A)

EVENT 17C HOVER-IN-GROUND-EFFECT (HEADING 240 DEGREES)

82.3 69.1 78.4 74.1 74.8 85.0 78.2 78.8 85.7 81.6 88.1 86.2 84.6 83.2
82.7 81.2 80.2 80.6 77.9 75.2 73.1 70.9 68.6 68.2 65.5 64.5 62.3 0.0

L(eq)= 90.3 dB(A)

NO DATA FOR EVENT 17D AT SITE 4

TABLE NO. 21

BELL 206B HELICOPTER (JET RANGER)

1/3 OCTAVE FREQUENCY SPECTRA

BOT/TSC
12/22/82

AS MEASURED AT THE DOWNTOWN HELIPORT *

SITE: 3 (254 Ft FROM PAD CENTER) NOV 16, 1982

LEVEL, db re20 micronPASCAL (25Hz - 10KHz)

(1.2 SECOND ENERGY AVERAGE)

EVENT 19A FLAT-PITCH IDLE-THRUST (HEADING 330 DEGREES)

63.7	62.6	62+3	64.7	68.5	66+2	71+1	65.4	63.4	64.7	70.5	68.2	62.4	61+0
60.8	57.3	54,7	54.1	49+9	46,7	45.X	45,6	42,8	42.0	42.3	44,6	41.4	0.0

L(eq)= 68+4 dB(A)

****

SITE: 4 (150 ft, FROM PAD CENTER) NOV 16, 1982

EVENT 19A FLAT-PITCH IDLE-THRUST (HEADING 330 DEGREES)

63.0	63+6	64.7	68.6	72.8	66,3	7@,8	68.8	66,3	6Y.5	77.7	73+9	67.9	66.7
66,6	62.31	60+2	5?,7	57.5	57.11	57.5	59.1	57+3	57.2	57.8	60.1	57.4	0+0

L(eq)= 75,@ db(A)

* - SURVEY DATA, LEVELS UNCORRECTED FOR TEMPERATURE AND HUMIDITY ;
NO CONTROL OR DOCUMENTATION ON HELICOPTER PERFORMANCE ;

TABLE NO. 22

BELL 206B HELICOPTER (JET RANGER)

1/3 OCTAVE FREQUENCY SPECTRA

DOT/TSC
12/22/82

AS MEASURED AT THE DOWNTOWN HELIPORT *

SITE: 3 (294 ft FROM PAD CENTER) NOV 16, 1982

LEVEL db re20 micropASCAL (25Hz - 10KHz)

(12 SECOND ENERGY AVERAGE)

EVENT 21A FLAT-PITCH IDLE-THRUST (HEADING 330 DEGREES)

64.1 62.8 60.5 66.0 63.0 69.0 64.6 62.2 62.3 64.3 70.9 69.2 63.0 60.5
59.6 56.5 55.4 53.6 49.3 46.4 45.1 46.9 42.4 39.4 38.6 37.6 38.6 0.0

L(eq)= 68.5 dB(A)

EVENT 21B HOVER-IN-GROUND-EFFECT (HEADING 330 DEGREES)

74.9 68.4 80.4 74.8 74.2 83.3 77.4 77.9 82.3 80.9 83.9 84.0 82.5 82.1
80.8 77.7 76.2 73.7 70.0 67.8 64.7 61.4 57.0 53.8 49.8 46.8 43.9 0.0

L(eq)= 86.7 dB(A)

EVENT 21C HOVER-IN-GROUND-EFFECT (HEADING 240 DEGREES)

79.1 69.1 80.0 72.0 71.0 74.9 72.7 74.2 78.1 76.2 79.8 78.6 79.3 79.3
78.5 76.2 73.4 71.0 66.5 63.4 59.4 56.7 53.5 53.2 48.2 46.8 46.0 0.0

L(eq)= 83.7 dB(A)

EVENT 21D FLAT-PITCH IDLE-THRUST (HEADING 240 DEGREES)

67.1 68.1 61.3 63.8 67.7 70.0 66.7 64.8 66.8 65.8 64.7 65.9 65.6 63.8
62.8 60.0 58.3 57.6 53.9 53.5 52.8 53.3 48.9 47.0 45.1 49.3 43.6 0.0

L(eq)= 69.6 dB(A)

****

SITE: 4 (150 ft FROM PAD CENTER) NOV 16, 1982

EVENT 21A FLAT-PITCH IDLE-THRUST (HEADING 330 DEGREES)

64.7 64.5 63.5 72.5 66.3 71.9 66.9 66.8 66.8 69.9 77.5 74.8 68.2 66.3
64.9 60.5 59.4 56.1 55.8 56.9 57.6 61.5 56.0 53.7 53.4 53.1 54.9 0.0

L(eq)= 74.6 dB(A)

EVENT 21B HOVER-IN-GROUND-EFFECT (HEADING 330 DEGREES)

84.2
84.1 80.8 86.2 81.3 78.8 76.7 74.2 72.9 69.5 67.5 91.1 62.1 88.4 80.0

L(eq)= 92.5 dB(A)

EVENT 21C HOVER-IN-GROUND-EFFECT (HEADING 240 DEGREES)

85.3 73.5 84.7 81.5 79.4 82.5 79.8 81.2 86.2 83.9 90.2 89.1 87.6 86.0
85.0 83.7 82.7 82.4 79.5 76.6 73.6 71.4 68.7 68.0 63.9 62.1 61.1 0.0

L(eq)= 92.5 dB(A)

NO DATA FOR EVENT 21D AT SITE 4

TABLE NO. 23

BELL 206L-1 HELICOPTER (LONG RANGER)

1/3 OCTAVE FREQUENCY SPECTRA

DOT/TSC
12/22/82

AS MEASURED AT THE DOWNTOWN HELIPORT *

SITE: 3 (294 ft FROM PAD CENTER) NOV 16, 1982

LEVEL db re20 microPASCAL (25Hz - 10KHz)

EVENT 23A FLAT-PITCH IDLE-THRUST (HEADING 330 DEGREES)

78.4 65.6 74.6 71.2 69.8 79.8 72.6 68.9 79.0 73.1 78.7 76.6 75.7 75.4
73.8 70.9 70.1 67.9 63.6 60.3 57.9 55.4 51.6 49.4 45.2 41.2 38.2 0.0

L(eq)= 80.2 dB(A)

EVENT 23B HOVER-IN-GROUND-EFFECT (HEADING 330 DEGREES)

76.0 66.3 78.0 74.7 71.7 82.8 75.8 75.3 82.1 79.7 83.7 82.3 82.0 81.9
79.4 75.3 73.9 72.0 67.1 65.3 62.4 59.4 54.7 51.9 48.7 45.8 43.0 0.0

L(eq)= 85.5 dB(A)

EVENT 23C HOVER-IN-GROUND-EFFECT (HEADING 240 DEGREES

79.3 67.3 78.0 73.7 75.9 77.1 77.7 76.9 79.5 80.8 83.2 82.4 82.3 81.9
80.7 77.2 75.4 74.2 71.2 68.5 65.1 61.6 58.5 54.7 51.4 48.1 45.4 0.0

L(eq)= 86.4 dB(A)

EVENT 23D FLAT-PITCH IDLE-THRUST (HEADING 330 DEGREES)

78.1 66.4 76.4 71.6 72.3 79.4 72.9 71.0 78.3 73.6 79.2 77.0 74.8 73.2
71.9 69.6 68.9 66.3 62.8 59.8 57.5 55.3 51.9 49.0 45.3 40.8 37.4 0.0

L(eq)= 79.1 dB(A)

****

SITE: 4 (150 ft FROM PAD CENTER) NOV 16, 1982

EVENT 23A FLAT-PITCH IDLE-THRUST (HEADING 330 DEGREES)

83.8 70.2 79.9 78.9 79.1 86.5 79.4 76.9 86.0 79.7 85.9 82.6 81.6 80.4
78.8 74.4 73.9 73.6 73.6 73.3 71.7 68.9 66.7 64.8 62.1 59.2 56.7 0.0

L(eq)= 86.5 dB(A)

EVENT 23B HOVER-IN-GROUND-EFFECT (HEADING 330 DEGREES)

84.4 73.0 85.1 83.5 81.5 87.5 81.0 81.5 89.2 85.5 89.7 88.0 87.6 86.5
84.7 79.1 77.8 78.0 75.1 74.2 71.5 70.1 66.7 64.7 62.6 60.9 59.0 0.0

L(eq)= 91.0 dB(A)

EVENT 23C HOVER-IN-GROUND-EFFECT (HEADING 240 DEGREES)

87.2 74.5 85.5 83.8 83.4 85.6 82.8 84.3 87.7 86.8 92.0 89.5 87.5 85.4
84.3 84.0 85.1 85.0 80.6 78.1 76.0 73.9 71.2 68.3 66.1 63.9 61.8 0.0

L(eq)= 93.5 dB(A)

NO DATA FOR EVENT 23D AT SITE 4

TABLE NO : 24

MEL-ICOPTER T A R G E T S OF OFFCURTUNITY

NOV 17 : 1982 EAST 60th STREET HELIPORT OPERATIONS

EVENT	OFIERATION!	HEEI.CXDRTER TYPE	REG#	AL.TI TUTE *
89	AF'FROACH	AUGUSTA A--1OY	N888MY	350
90	TAKEOFF	BELL 2061	Nl 08F	200
91	APPROACH	BELL h-222	N2772HH	..
96	APPROACH	AUGUSTA A--109	N977SW	..
97	APPROACH	BELL E--222	N303SC	330
98	TAKEOFF	AUGUSTA A--109	N888HY	150
99	TAKEOFF	AUGUSTA A-- 109	N977SW	350
100	APPROACH	BELL B--222	N969YC	350
102	TAKEOFF	BELL 47d	N5832F	250
103	APPROACH	BELL B--y22	N2772HH	..
104	APPROACH	SIKORSKY S-76	N31AM	180
105	TAKEOFF	SIKORSKY S-76	N31.60	270
106	TAKEOFF	BELL E--222	N2772HH	200
108	APPROACH	BELL 206L	N1006F'H	..
109	TAKEOFF	SIKORSKY S--76	N3WL	200
110	APPROACH	BELL L 206B	N59530	400
111	TAKEOFF	BELL 206B	N59530	300
112	TAKEOFF	BELL 206L	NSOOFHH	280
113	APPROACH	BELL B-222	N2772W	
114	TAKEOFF	BELL B--222	N303SC	

* ALTITUDE (FEET) REP'ORTED BY P'ILOTS As HELICOPTER CROSSED WEST BANK OF ROOSEVELT ISLAND :

TABLE NO: 25

EAST 60th ST, HELIPORT OPERATIONS

DOT/TSC
12/30/82

SUMMARY SURVEY NOISE LEVEL DATA

AS MEASURED *

SITE: 6 ROOSEVELT ISLAND (650 ft FROM PAD CENTER) NOV. 17 - 1982

EV	SEL	DBA(M)	DASPL	PNL(M)	PWL(M)	DUR(A)
APPROACH						
89	95.7	87.1	95.4	98.1	99.4	18.5
91	97.6	90.3	102.0	103.8	104.4	11.0
96	92.7	84.6	97.3	96.9	98.5	17.0
97	97.0	89.4	101.5	103.1	103.7	13.0
100	92.5	83.1	97.9	97.2	97.8	22.5
103	82.9	74.7	89.3	89.1	90.4	13.5
104	98.2	89.8	95.9	101.5	102.9	13.0
108	86.9	79.4	88.0	90.4	92.2	14.0
110	87.2	77.5	87.1	89.2	90.3	24.0
113	96.8	89.9	101.7	103.4	104.5	10.5
TAKEOFF						
90	87.6	76.5	85.5	87.6	89.2	19.0
98	96.2	85.2	94.6	96.7	98.5	31.0
99	93.3	84.5	92.2	95.1	96.6	12.5
102	91.5	83.6	94.1	96.1	97.4	16.0
105	89.1	80.9	86.0	91.9	93.1	9.0
106	85.5	77.8	89.6	89.8	91.0	9.0
109	92.3	85.8	89.8	95.7	97.1	9.0
111	90.3	81.2	87.5	92.9	94.9	24.0
112	89.0	81.2	88.9	94.1	96.0	12.5
114	76.4	70.1	81.4	81.7	83.5	7.5

* - SURVEY DATA-. LEVELS UNCORRECTED FOR TEMPERATURE AND HUMIDITY; NO CONTROL ON HELICOPTER POSITION OR PERFORMANCE.

(SEE TABLE 24 FOR HELICOPTER TYPE)

TABLE NO + 26

AUGUSTA A109 HELICOPTER

1/3 OCTAVE FREQUENCY SPECTRA at PNLTwisx

ASOT/TSC
12/22/82

AS MEASURED E+60th ST + HELIPORT OPERATIONS *

SITE: 6 ROOSEVELT ISLAND (650 ft FROM PAD CENTER) NOV 179 1982

LEVEL db re20 micraPASCAL (25Hz - - 10KHz)

EVENT 89 APPROACH (REG# 888MY)

92.7	84+7	67,6	76+5	73.8	79,1	68.8	68.7	74+2	7915	7912	7792	81*4	86+0
82,8	76,2	74,2	75.6	72!,0	68+9	67+1	63.9	59+7	55.7	49*11	41.1	36*6	â+0

EVENT 98 TAKEOFF (REG# 888MY)

86.6	80,0	74.8	81,4	83.4	89.0	72.4	77.2	78+1	79.8	78+0	80+2	80.8	75.7
78.6	77,8	78.0	73.5	70+7	69.5	66+8	63,5	58,3	52.3	44+5	37.5	35.5	0+0

EVENT 96 APPROACH (REG# 977SW)

95*1	87,8	72.4	78,4	75.7	74.5	74.0	80+1	87+5	75.4	77+4	82.2	78.2	77.2
76.1	74.9	7%,7	71,4	71+4	70.1	67+5	65+2	62+2	58.6	54.6	49.3	44,1	0.0

EVENT 99 TAKEOFF (REG# 977SW)

82,9	70.9	67+7	74,4	8 2.5	85.5	69.9	72.1	73.8	78,5	78.7	79.9	76+2	76+3
77+6	76+6	75+9	74.2	72.5	68.7	66.6	63.4	58.6	52+9	45+9	37+4	27.8	0+0

* = SURVEY DATA , LEVELS UNCORRECTED FOR TEMPERATURE AND HUMIDITY.
NO CONTROL ON HELICOPTER POSITION OR PERFORMANCE.

TABLE NO, 27

BELL 206B HELICOPTER (JET RANGER)

DOT/TSC
12/22/82

1/3 OCTAVE FREQUENCY SPECTRA at FNLTaiax

AS MEASURED E ,6#th S T - HELIPORT OPERATIONS *

WITH: 6 ROOSEVELT ISLAND (650 ft FROM PAD CENTER) NOV 17, 1982

LEVEL dB re20 microPASCAL (25Hz - 10KHz)

EVENT 90 TAKEOFF (REG# 108F)

72.6	68.1	69.3	69.1	69.6	82.2	76.1	67.5	73.4	69.7	71.3	67.0	68.7	67.9
66.4	69.8	67.0	65.9	64.0	60.5	57.4	54.1	49.9	44.0	36.5	29.3	27.3	0.0

EVENT 110 APPROACH (REG# 59530)

83.7	71.7	93.9	69.0	67.3	70.2	71.8	72.1	76.2	71.7	74.2	71.3	70.6	71.8
74.0	69.0	65.5	64.2	62.6	59.6	57.4	55.3	51.4	48.3	46.5	51.1	48.0	0.0

EVENT 111 TAKEOFF (REG# 59530)

75.9	68.8	70.5	68.1	70.4	77.6	68.8	67.9	82.4	73.5	78.6	68.0	73.5	71.8
74.4	73.6	71.4	71.3	70.1	67.7	65.6	62.7	58.5	55.9	52.2	48.4	40.5	0.0

* - SURVEY DATA, LEVELS UNCORRECTED FOR TEMPERATURE AND HUMIDITY ;
NO CONTROL. ON HELICOPTER POSITION OR PERFORMANCE.

TABLE NO), 28

BELL E-222 HELICOPTER

DOT/TSC
12/22/82

1/3 OCTAVE FREQUENCY SPECTRA at FINLTmax

A s MEASUREX b6oth ST+ HELIPORT OPERATIONS *

SITE:.: 6 ROOSEVELT ISLAND (650 ft FROM PAD CENTER) NOV 17-, 1982

LEVEL, db re20 microPASCAL (25Hz - 10KHz)

EVENT 9 1 APPROACH (REG# 2772H)

95+4	81,;4	82,0	82.1	82.2	77,$	89+4	94,7	95,1	91,0	87.2	89+7	85+2	83.9
80.7	78,3	74+7	73,1	70.7	69.0	67+3	65,$	62+7	60.6	hi,6	66.5	68+8	0,0

EVENT 97 APPROACH (REG# 303SC)

95cl	83,0	85.7	81 ,5	79,1	79+7	9013	95,1	94+6	88.4	88+7	89.2	84.2	80.6
78,5	76.7	74+5	72.5	70,4	68+5	66+4	64,X	62.2	59.2	58,5	63.4	64+6	0,0

EVENT 1 1 4 TAKEOFF (REG# 303SC)

72.5	69,7	67+0	65+3	774.6	62.5	58.5	64.3	59.0	6643	7010	65.4	59+9	65,5
65.4	61 a2	58.5	57.3	55.3	5312	50,3	47+0	44.7	39,5	38+1	30.4	27.1	0,0

EVENT 100 APPROACH (WEG# 969YC)

88+2	89',0	83,7	83+5	820.4	78.2	76.5	82.3	84.9	87+2	83+3	77.4	78.3	73,4
74.8	72.7	69,6	68.8	66.9	64.j	62.6	60+6	57.0	53.8	53+7	53,2	49.6	0.0

EVENT 1 03 APPROACH (REGJ# 2772H))

86.1	70.4	73,1	70+3	70.3	67,1	6719	79.6	82+0	77.5	6949	71.9	67+0	64.8
62+1	60.7	60.6	593,4	58.3	57.,1	55.4	53.4	51+7	49.8	50+3	53.5	54,2	0.0

EVENT 106 TAKEOFF (REG# 2772H)

79,Y	74.4	76+5	78.6	83.31	78.1	72.3	78,5	68,$	71,7	7012	68,J	72.0	73+9
7019	6'8.5	70+2	64,9	63.3	61.6	58+9	55.2	50,9	45.4	41.7	336,0	26.6	0,0

EVENT 113 APPROACH (REG# 2772H)

95+5	80,J	80+9	81,9	8014	83.6	95,$	92.9	91,8	85,7	91.2	89.0	86,5	82.3
79*3	776.5	74.2	73.6	71+1	69,6	67.0	64.7	62.8	60.6	60.4	66.0	67.9	0+0

$ = SURVEY DATA, LEVELS UNCORRECTED FOR TEMPERATURE AND HUMIDITY ;
NO CONTROL ON HELICOPTER POSITION OR PERFORMANCE.

TABLE: NO, 29

BELL.. 206L HELICOPTER (LONG RANGER)

1/3 OCTAVE FREQUENCY SPECTRA at FNLTmax

AS MEASURED E:, 60th ST , HELIPORT OPERATIONS 8

SITE:: 6 ROOSEVELT ISLAND (650 ft FROM PAD CENTER) NOW 17, 1982

LEVEL db re:20 microbARS OAL (25Hz - KOKHz)

EVENT 108 APPROACH (REG# 1,OOFH)

74.5	6t3+3	74,6	66,7	71.6	84.6	73+4	76,b	76e5	75,l	75.6	73.11	70+9	67,3
66.6	66.4	6415	63,9	63.4	60,2	58+2	56.2	53.2	52.7	48'11	46+5	44,l	0+6

EVENT 1 12 TAKE:OFF (REG# KOOFH)

79,8	bt8.9	7:1.+4	7046	74.9	74,11	7yDe7	69.6	84,8	77+5	73,5	74.8	72+t8	71,1
72,2	72,4	70,6	71-4	7O#,O	69+1	67+2	6540	61+2	56.7	52+2	4"7+0	4019	0+Q

8 " SURVEY DATA" LEVELS UNCORRECTED FOR TEMPERATURE: AND HUMIDITY,
NO CORRECTION ON HELICOPTER POSITION OR PERFORMANCE+

TABLE NO. 30

BELL 47 J HELICOPTER

1/3 OCTAVE FREQUENCY SPECTRA at MAXIMUM

DOT/TSC
12/22/82

AS MEASURED AT 60th ST HELIPORT OPERATIONS *

SITE: 6 ROOSEVELT ISLAND (650 ft FROM PAD CENTER) NOV 17, 1982

LEVEL, db re 20 micro PASCAL (25Hz - 10KHz)

EVENT: 02 TAKEOFF (REG# 5832F)

70.4	75.8	82.4	77.4	82.6	76.7	71.5	82.9	78.3	82.8	73.5	78.7	78.3	77.1
75.2	75.3	72.7	74.0	78.8	69.7	68.0	65.4	62.2	58.2	54.9	52.3	49.1	0.0

* - SURVEY DATA; LEVELS UNCORRECTED FOR TEMPERATURE AND HUMIDITY
NO CONTROL ON HELICOPTER POSITION OR PERFORMANCE

TABLE NO. 31

SIKORSKY S-76 (SERIAL) HELICOPTER

DOT/TSC
12/22/82

1/3 OCTAVE FREQUENCY SPECTRA at FINAL Tmax

AS MEASURED E+hOth ST ; HELIPORT OPERATIONS *

SITE: 6 ROOSEVELT ISLANDS (650 Pt, FROM PAS CENTER) NOV 17, 1982

LEVEL db re 20 microPASCAL (25tiz - 10KHz)

EVENT 104 APPROACH (REG# 3160)

73.1	70*5	83.1	74+7	84,9	78.8	72,J	78.1	82.9	86,3	89,2	134,3	88+7	84+4
82.5	79+5	78+3	76.3	73,0	71.0	67.5	64.3	61+5	57.4	53,9	49.5	43.4	0.0

EVENT 105 TAKEOFF (REG# 3160)

67al	68.0	71+2	61B+3	67,4	68+9	72.8	69.5	67.0	80.0	76+4	7264	73,W	74+7
74.7	73.2	71+3	68.3	65.8	64.3	63.0	6018	57*2	52.9	47.5	39,6	31,3	0,0

EVENT 109 TAKEOFF (REG# 3W.)

69,9	69.3	80.5	h?+2	70+6	68+4	78.8	76,l	66.9	77+4	76+7	79+3	74.0	81+0
79.7	81+3	75.6	73+9	70.3	67.8	66.2	63+5	60.9	57.4	5X.6	44.5	35.6	0.0

* - SURVEY DATA, LEVELS UNCORRECTED FOR TEMPERATURE AND HUMIDITY ; NO CONTROL ON HELICOPTER POSITION OR PERFORMANCE.

APPENDIX A – ON-SITE OBSERVATIONS AND WEATHER DATA

Appenxix A contains tables which present a collection of physical and weather data observed by instrument operators during the measurement periods. Operators were instructed to log and identify as much pertinent information as practical. This included, in order of preference: 1) heliport operations, 2) loud events of any type, 3) helicopter and airplane flybys, and 4) local traffic. For each type of activity during each period, observers noted the maximum noise level obtained from the LED display on the Gen Rad 1945 Community Noise Analyzer. (In some cases, maximum noise levels were obtained from the graphic level records.) Tables A1–A6 contain data for Sites 1, 2, 5, 6, 7 and 8 respectively. Table A7 contains weather data gathered at Site 3 and 6.

It should be emphasized that observers were not able to record all pertinent information that actually occurred. For example, an observer might be occupied logging a helicopter arrival and omit a helicopter flyby or truck passby occurring at the same time. Thus, the data in Appendix A is not complete, but is intended to provide information which is never the less useful in quantifying the measured noise levels. Where possible, traffic counts on the nearest through roads were performed. Traffic counts conducted for less than 30 minute periods were extrapolated to 30 minutes, as indicated in the tables.

Table No. A1

ON-SITE OBSERVATIONS
(30-minute periods)

Site No. 1 - Vicinity of West 30th Street Heliport
New York, New York — November 16, 1982

START TIME	HELIPORT OPERATIONS		HELICOPTER FLYBYS		AIRPLANE FLYBYS		TRAFFIC			OTHER ACTIVITY	
	No.	LMAX	No	LMAX	No.	LMAX	AUTO No	TRUCK No.	LMAX	TYPE	LMAX
0800	0	-	1	63	1	67		5	72	Bang/Demolition	69
0830	3	78	1	66	—	—		1	71	Bang/Demolition	75
0900	4	82	1	64	1	73		1	66	Jackhammer	74
0935	1	71	—	—	—	—		5	72		—
1005	1	79	2	74	4	79		2	70		—
1035	3	82	4	79	—	—		5	81		—
1125	3	67	2	72	—	—		1	67		—
1155	0	—	2	75	2	63		1	67	VOICE near Microphone	75
1225	1	71	2	69	1	70		1	66		—
1300	3	70	—	—	4	69		4	69	OIL Drum Banging	79
1330	1	68	—	—	2	73		0	—	CONTAINER BANGINGS	75
1400	3	78	1	69	—	—		1	72	WRECKING Impact	76
1440	7	83	1	71	—	—		1	78	DEMOLITION	—
1510	8	83	—	—	—	—		1	72	DEMOLITION	84
1540	1	81	1	78	—	—		—	—	—	—
1615	5	73	3	72	—	—		2	78	—	—

Table No. A2

ON-SITE OBSERVATIONS
(30-minute periods)

Site No. 2 - Vicinity of Downtown Heliport, South Street
New York, New York — November 16, 1982

START TIME	HELIPORT OPERATIONS		HELICOPTER FLYBYS		AIRPLANE FLYBYS		TRAFFIC			OTHER ACTIVITY	
	No.	LMAX	No	LMAX	No.	LMAX	AUTO No.	TRUCK No.	LMAX	TYPE	LMAX
0900	13	81	1	74				3	74	Boat Whistle	77
0930	8	81	1	74				3	80	Boat Whistle	84
0900	3	78	1	78				9	85	Boat Whistle	80
0935	8	79	2	76				8	79	Voice Scream	89
1005	3	78	5	80			522	18		* Horn	91
1035	12	82	3	74			342	18		* Horn	91
1125	3	80	3	80			270	30	81	*	
1155	8	84	5	74			234	35		*	86
1225	2	79	2	73			150	72	84	*	
1300	5	79	4	70				4	80		
1330	3	83	1	74			360	66		* Ambulance Siren	96
1400	5	81	1	75				5	81		
1450	—	—	1	73				1	76		
1520	1	78	6	77	1	78	300	48		* Police Siren	94
1550	1	75	7	76				2	80	Motorcycle	85
1625	4	80	2	73	1	73		2	83	Sea plane T/o	91

Table No. A3

ON-SITE OBSERVATIONS
(30-minute periods)

Site No. 5 - Apartment Playground West of East 60th Street Heliport
New York, New York - November 17, 1982

START TIME	HELIPORT OPERATIONS		HELICOPTER FLYBYS		AIRPLANE FLYBYS		TRAFFIC			OTHER ACTIVITY	
	No.	LMAX	No	LMAX	No.	LMAX	AUTO No.	TRUCK No.	LMAX	TYPE	LMAX
0800	9	88	3	75						Construction Bang	79
0830	4	85	2	73							
0900	8	86	3	72							
0935	2	85	—	—							
1005	5	90	1	74							
1035	5	85	—	—						unidentified EVENT	88
1110	5	86	2	72							
1145	3	91	—	72							
1215	9	89	2	74						Unidentified event	81
1245	6	84	2	74						Repositioning OF helicopter on pad	78
1315	7	86	7	73							
1345	11	90	1	74							
1420	7	86	3	78							
1450	4	86	2	76							
1520	6	90	5	84							
1610	12	89	3	74							

Table No. A4

ON-SITE OBSERVATIONS
(30-minute periods)

Site No. 6 - Roosevelt Island, 650 East
of East 60th Street Heliport
New York, New York - November 17, 1982

START TIME	HELIPORT OPERATIONS		HELICOPTER FLYBYS		AIRPLANE FLYBYS		TRAFFIC			OTHER ACTIVITY	
	No.	LMAX	No	LMAX	No.	LMAX	AUTO No	TRUCK No.	LMAX	TYPE	LMAX
0800	8	86	4	75	—	—		3	75		
0830	4	81	3	69	1	68		2	77	RIVETING	75
0900	8	89	—	—	—	—	42	22		RIVETING	75
0935	2	80									
1005	4	92	1	73						RIVETING	79
1035	4	80					12	7		*	
1115	5	89									
1145	4	80								RIVETING	75
1215	6	85					14	9			
1320	4	86					1	—	69		
1350	8	92								RIVETING	80
1430	6	84								RIVETING	77
1500	3	78								RIVETING	78
1530	5	91								RIVETING	75
1600	9	90					18	3			
1630	10	92					13	6			

Table No. A5

ON-SITE OBSERVATIONS
(30-minute periods)

Site No. 7 - Roosevelt Island — South of Appartment Complex
East 60th Street Heliport
New York, New York — November 17, 1982

START TIME	HELIPORT OPERATIONS No.	HELIPORT OPERATIONS LMAX	HELICOPTER FLYBYS No	HELICOPTER FLYBYS LMAX	AIRPLANE FLYBYS No.	AIRPLANE FLYBYS LMAX	TRAFFIC AUTO No.	TRAFFIC TRUCK No.	TRAFFIC LMAX	OTHER ACTIVITY TYPE	OTHER ACTIVITY LMAX
0800	8	82	3	73	1	74		2	72	unidentified	88
0830	4	78	7	74	—	—		2	74		
0900	8	81	3	73	—	—		3	71		
0935	—	—	1	77	1	72		5	74	Bang from truck	103
1005	5	78	5	76				4	68		
1035	4	72	5	72						Children Shouting in Mic.	100
1125	5	80	3	72						Boat Whistle	70
1155	3	75	5	70				3	69		
1225	7	80	3	71				2	75		
1300	5	76	5	74	2	70		3	70		
1330	7	81	6	72				3	72		
1400	7	82	2	70	1	68		6	71		
1450	5	72	4	68				2	70	Screaming Children	108
1520	4	79	7	66	1	69		5	72		
1550	9	76	3	71				5	77	Sirens	77
1625	12	80	3	72	1	76	—	—			

Table No. A6

ON-SITE OBSERVATIONS
(30-minute periods)

Site No. 8 - Roosevelt Island, 2100 Feet North-North-East
East 60th Street Heliport
New York, New York — November 17, 1982

START TIME	HELIPORT OPERATIONS No.	HELIPORT OPERATIONS LMAX	HELICOPTER FLYBYS No	HELICOPTER FLYBYS LMAX	AIRPLANE FLYBYS No.	AIRPLANE FLYBYS LMAX	TRAFFIC AUTO No.	TRAFFIC TRUCK No.	TRAFFIC LMAX	OTHER ACTIVITY TYPE	OTHER ACTIVITY LMAX
0800	9	75	10	71	3	62	—	6	67	Engine Noise	65
0830	4	73	7	71	1	59	—	6	62	Tugboat	64
0900	8	72	3	66	1	67	—	8	67		
0935	2	70	1	64	1	66	—	8	66	Tugboat	60
1005	5	77	2	76	—	—	—	4	67		
1035	5	72	5	66	2	64	—	6	65	Siren	60
1120	5	72	3	65	3	61	—	10	67	Construction Noise	60
1150	3	67	2	69	1	59	—	3	65	Tugboat	58
1220	9	72	2	69	—	—	—	5	62	Tugboat	62
1255	6	70	2	65	1	67	—	2	59	Construction Noise	61
1325	—	—	—	—	—	—	—	—	—		
1355	11	67	2	60	2	62	—	5	63	Siren	68
1440	7	71	3	67	5	66	2	6	71		
1510	4	75	7	65	4	63	—	9	61		
1540	6	71	8	67	1	62	—	3	62	Siren	58
1615	12	71	2	71	2	72	—	3	61		

Table No. A7

WEATHER DATA

Time	Temperature	Relative Humidity	Barometric Pressure	Wind Speed	Wind Direction	Sky Conditions
	November 16, 1982		Site 3	Downtown Heliport		
1120	42°F	56%	780mm	<5mph	South	Clear
1243	42°F	56%	780mm	<7-8mph	Southeast	Clear
1409	42°F	56%	780mm	<5-7mph	Southeast	Clear
	November 17, 1982		Site 6	Roosevelt Island		
0850	46°F	70%	720mm	<3mph	Southeast	Cloudy
1011	50°F	69%	776mm	<3mph	Southeast	Partly Cloudy
1118	53°F	59%	772mm	<3mph	Southeast	Mostly Clear
1237	54°F	53%	773mm	<3mph	Southeast	(Clouds to East)
1311	54°F	52%	775mm	<3mph	Southeast	Partly Cloudy (high thin clouds)

Office of Environment
and Energy
Washington, D.C. 20591

Helicopter Noise Survey at Selected New York City Heliports

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